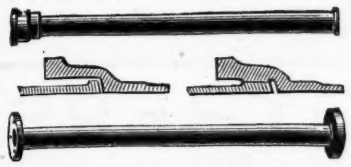
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1806.] LONDON, DECEMBER 21, 1897. [49TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



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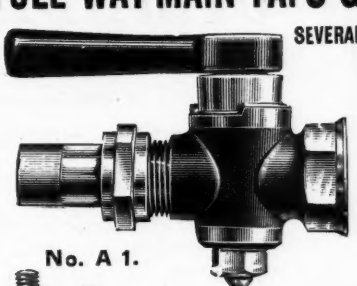

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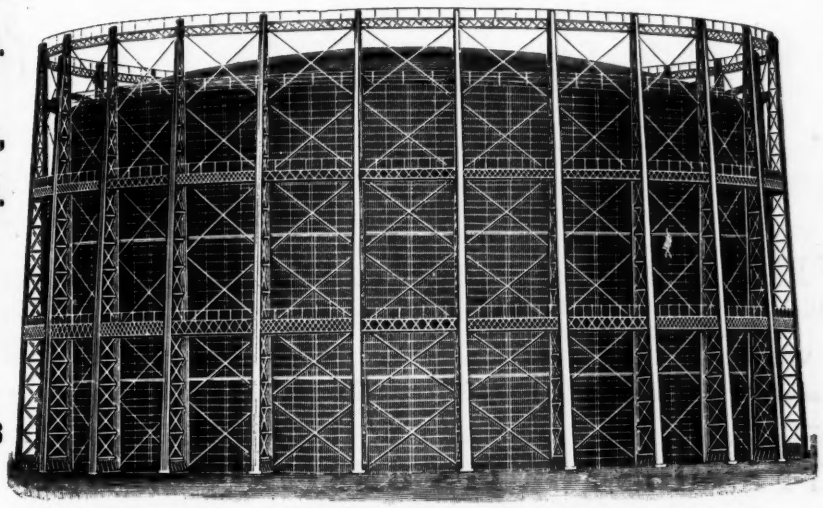

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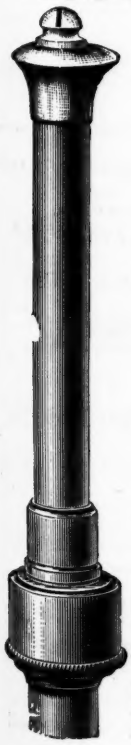

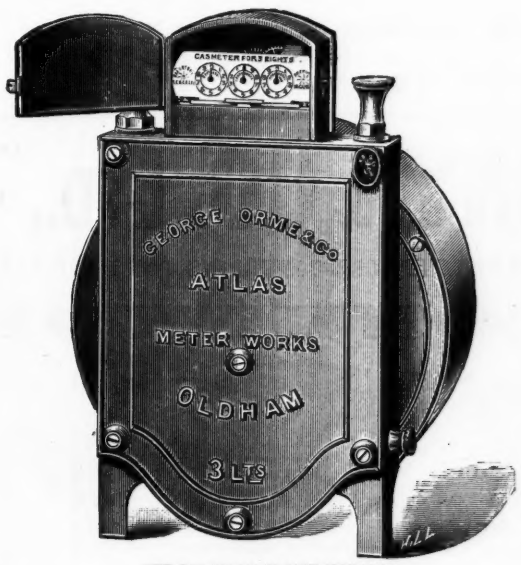

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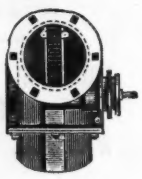

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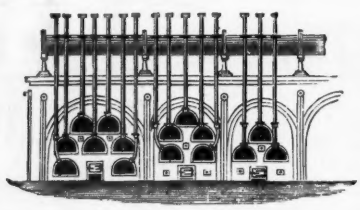

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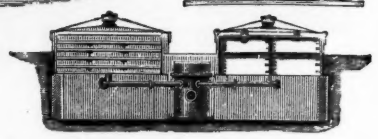

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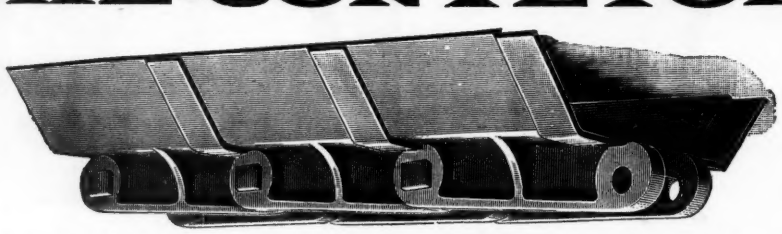

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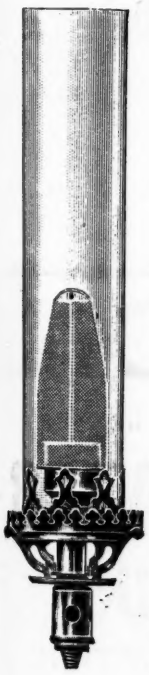

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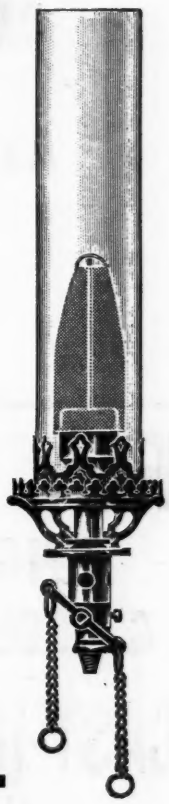

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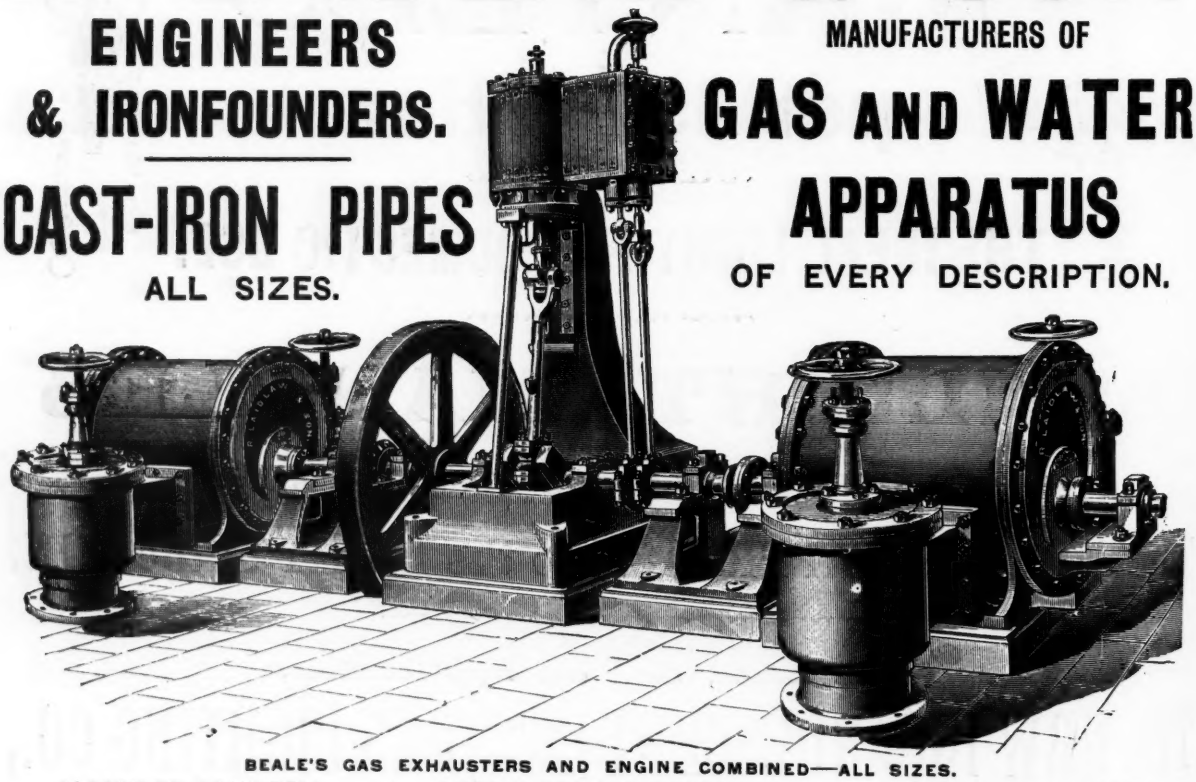

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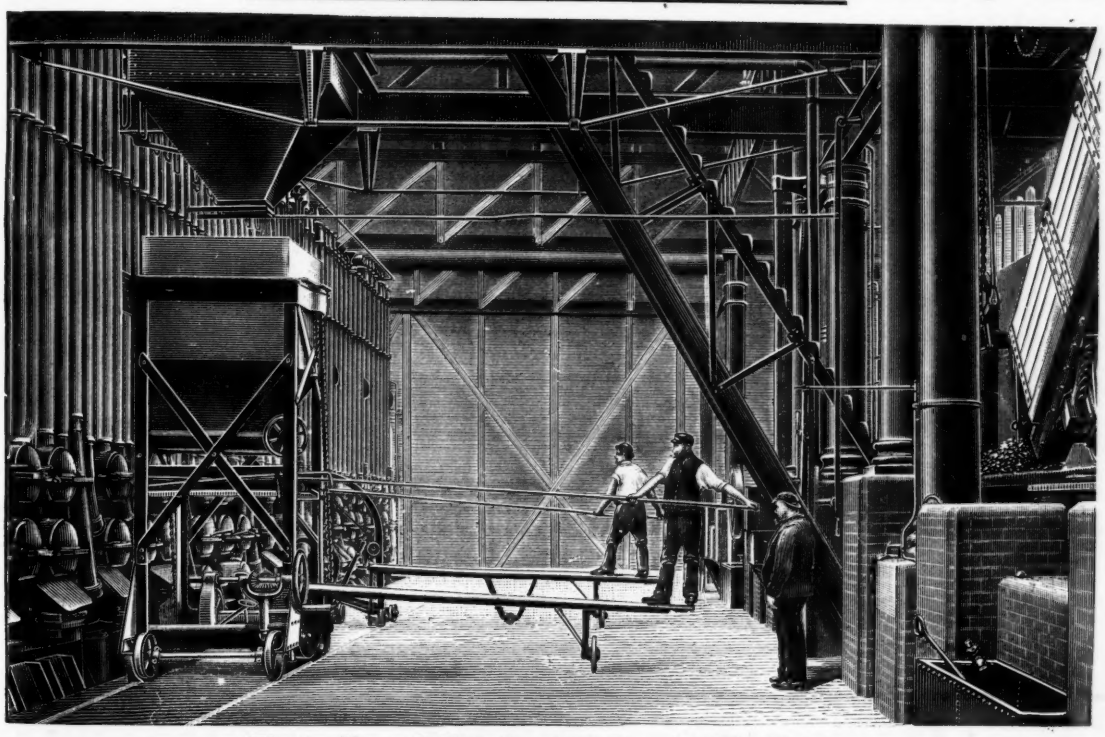

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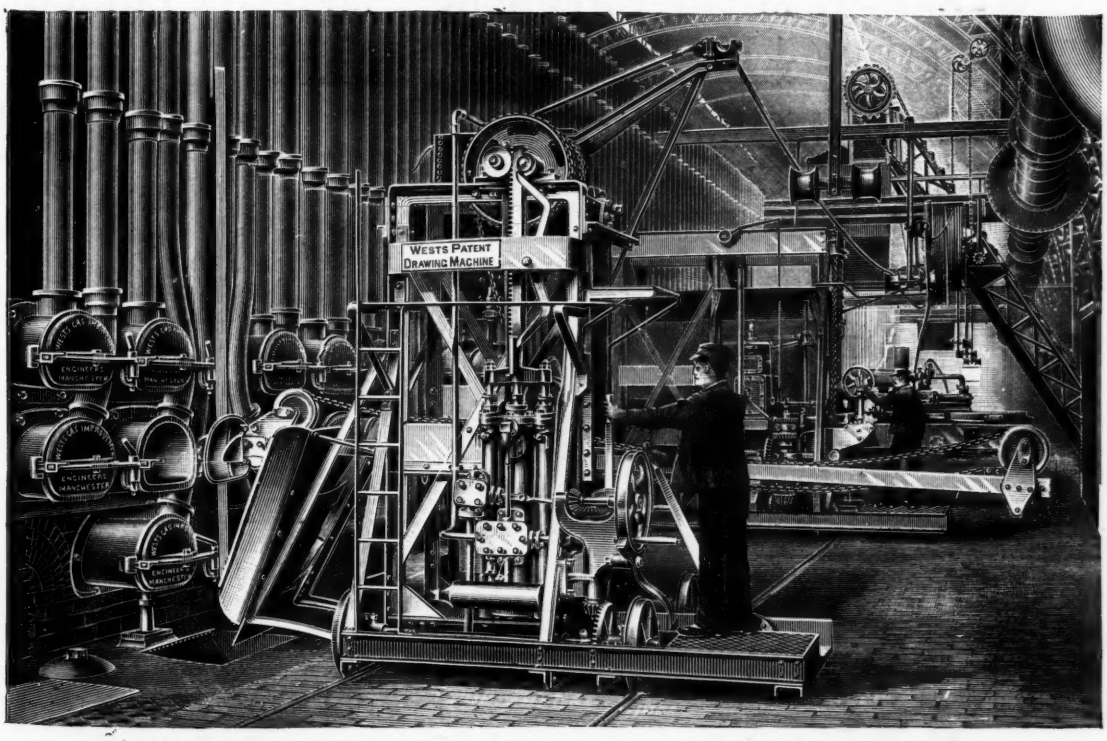

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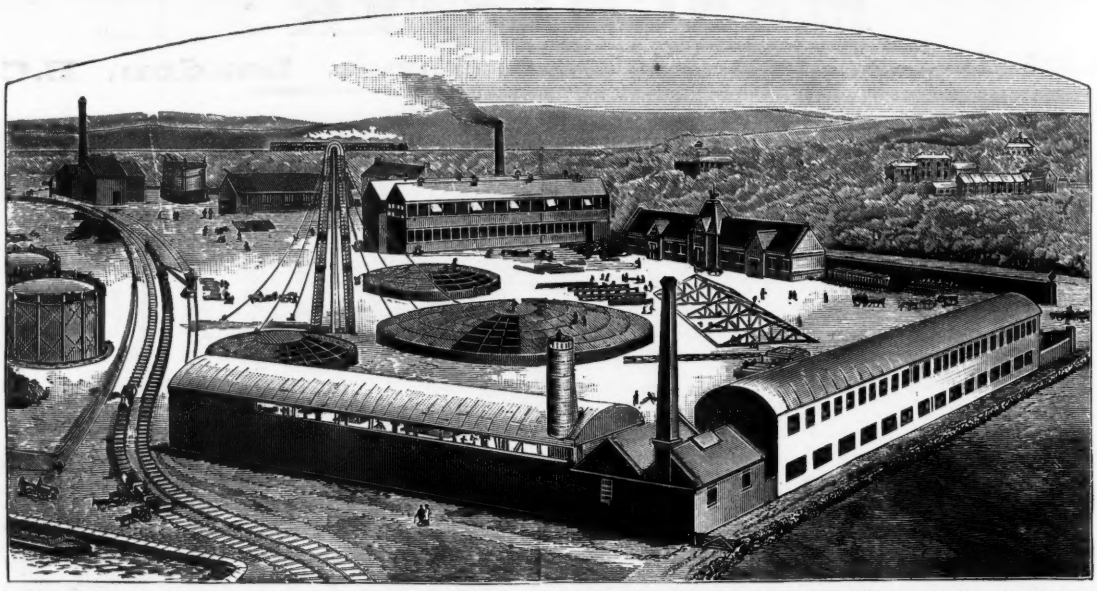

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Highest Efficiency with Greatest Economy.

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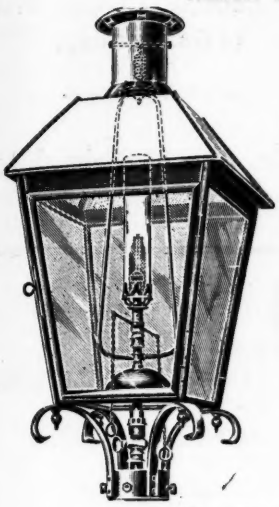
INCANDESCENT GAS-LIGHT

(Welsbach System),

which has now been successfully adapted to the purposes of



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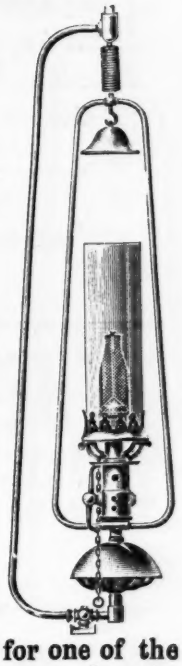
the difficulties caused by VIBRATION having been OVERCOME by the use of the

NEW SPRING SUSPENSION FRAME (Patent).

This System of Lighting meets the requirements of all Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting WITHOUT INCREASE OF EXPENDITURE.



The following are Extracts from a PAPER read by Mr. F. G. DEXTER, before the SOUTHERN DISTRICT ASSOCIATION.

"The success of the experimental (Welsbach) lighting secured the contract for one of the Parish Council Districts; and this was shortly followed by the contract for three years for the city lamps. The total represents altogether about 500 single lamps, and 15 refuge lamps containing two lights."

"In the matter of maintenance of the street lights, the record is favourable—in fact, more so than the estimate provided. By the test-meter, the average daily consumption works out to 38 cubic feet per light, including bye-pass. The bye-pass consumes with a flame half an inch long, $\frac{1}{6}$ foot per hour. This represents 1000 cubic feet per lamp per annum. The average consumption per light, when in use, works out to 12,900 feet per annum, or about $3\frac{3}{5}$ feet per light per hour. The lighting is continued all the year round, from the average times of one hour after sunset to one hour before sunrise."

"The mantles have worked out to an average of three per lamp per annum; but, bearing in mind the absence of frost last winter, the writer believes that four mantles per light is more likely to represent average conditions."

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"The number of lights attended to per man averages 85."

"The 'Welsbach' Light is undoubtedly one of the greatest aids to successful competition that the Gas Industry has ever experienced. Its influence, while reducing the relative cost of light, has advanced the consumption of gas all over the country by the increased satisfaction of the existing consumers, and the attraction of others. The writer feels that its influence should not be confined to the house. It is capable of meeting every competitor in the street, from cheap oils to arc lights, in cost and in effect; and it is hoped that the foregoing experience may lead many others to seek its aid and to realize its efficiency."

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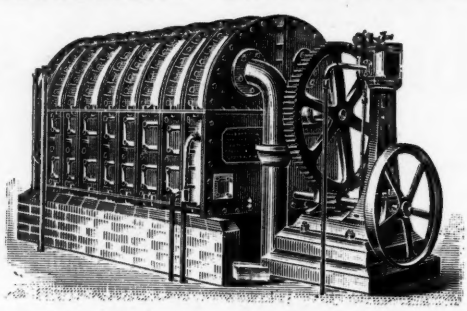
PATENT "STANDARD" WASHER-SCRUBBER.

This Apparatus upholds its title, the "STANDARD;" being recognized by leading Engineers as the most efficient Apparatus for the Extraction of Ammonia from Coal or other Gases.



The Largest Order ever given for WASHER-SCRUBBERS was recently received being for **16** Patent "Standard" Washer-Scrubbers, each for 3,500,000 Cubic Feet of Gas per day.

Number of Patent "STANDARD" Washer-Scrubbers in use at this date

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GASHOLDERS

OF EVERY SIZE AND DESCRIPTION.

CUTLER'S PATENT GUIDE-FRAMING FOR GASHOLDERS

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IT IS STRONG AND CHEAP, AND REQUIRES NO PIERS FOR ITS SUPPORT.

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Brussels (Second Contract)	700,000	Lea Bridge	350,000
Liverpool	3,500,000	Lea Bridge (Second Contract)	350,000
Tottenham	750,000	Guildford	350,000
Tottenham (Second Contract)	750,000	Stockton-on-Tees	500,000
Santiago	400,000	Syracuse, N.Y.	850,000
Swansea	750,000	Brentford	1,200,000
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Brighton	1,750,000	Commercial Gas Co. (Second Contract)	850,000
Preston	1,500,000	Bridlington	125,000
New York	1,200,000	Middlesbrough	1,250,000
Southport	750,000	Croydon	1,250,000
Bath	1,000,000	L. & N.W. Railway, Crewe	700,000
Newburgh, N.Y.	350,000	Taunton	225,000
Newburgh, N.Y. (Second Contract)	250,000	Lawrence, Mass.	400,000
Hoylake	125,000	Rotterdam	850,000
Coventry	600,000	Dorking	125,000
Coventry (Second Contract)	600,000	McKeesport, Pa.	500,000
Bordentown, N.J.	125,000	The Gaslight and Coke Co., Bromley	3,600,000
Winchester	200,000	The Gaslight and Coke Co., Nine Elms	2,650,000
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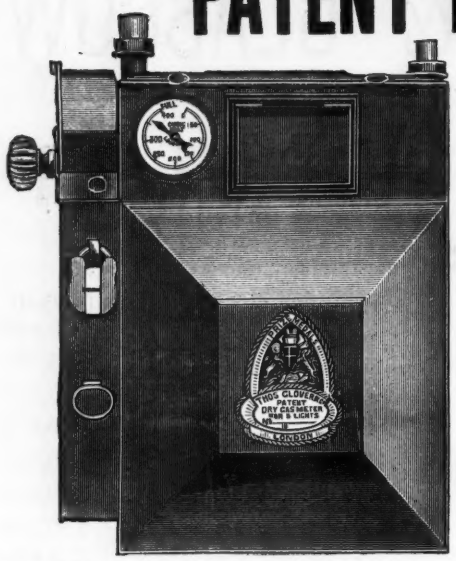

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EDITORIAL NOTES.

The Engineers' Strike.

THE latest news concerning the engineering strike is that the conference met again last Tuesday as arranged, and broke up for the Christmas holidays on Friday, having accomplished nothing beyond in a slight degree recasting certain of the employers' terms of settlement. Even so the time was not wasted. As we remarked last week, the rejection of the original terms by the men's vote meant nothing at all. If the vote had been taken seriously, there would have been an end of the conference; but the circumstance of negotiations being resumed showed once more that in the working of Trade Unions the members are helpless puppets in the hands of the Executive. The latter go through the formality of taking a ballot occasionally; but whether the result is to be made operative or not is a matter which they keep within their own control. From the first day of the resumption of the conference, rumours were persistently spread to the effect that some settlement might be expected; and, from the character of these reports and the agencies employed to spread them, it appeared certain that desperate efforts were being made to create the impression that the employers were giving way. If the slightest concession could be signalized, the Trade Union leaders would be glad enough to give in. On Friday a news agency went the length of reporting to the evening newspapers that the masters had given way on the question of works management. But the statement was incredible; and the official communication of the result of the conference up to the end of the day did not confirm it. What has actually been done is as follows: Some of the terms of the original ultimatum of the masters having been declared by an eminent lawyer-politician and other notable outsiders to be of doubtful meaning, the terms in question were recast with the object of removing the possibility of misconception by anybody not paid for the purpose. We published the original terms, and now, after going over them carefully and comparing them with the new formulæ, we find there is so very little difference as to render it unnecessary to occupy space with a reproduction of the latter. When the business is finished we will publish the final terms of settlement. In the meantime, it must be recorded that the revised version was provisionally agreed upon by the conference. Upon this point the "Daily "News," which is on the side of the men, observes that the masters' new terms show "a very considerable modifi- "cation in what was generally understood to be meant "by their ultimatum of a fortnight ago. Among other "important points, the men have succeeded in getting "their right of collective bargaining expressly admitted, "in cases where the former proposals of the employers "seemed to exclude it. On the whole, the terms finally "laid down for defining the freedom of management are "such that the men's delegates provisionally agreed to "them; and if they could have got, as a *quid pro quo*, some "reduction in the hours of labour, or the prospect of "a reduction through arbitration, they would, it is be- "lieved, have accepted them outright." That is just it. The delegates wanted something, however small or remote, to show as a gain by the strike; and the masters did not gratify them.

With regard to the assertion that the "right of collective "bargaining" has been "expressly admitted" in the new terms, this is the interpretation put upon two modifications, the first of which states that if a Trade Union desires to raise any question arising from the introduction into a federated shop of a condition of working existing in any other federated shop, "a meeting can be arranged by "application to the Secretary of the Employers' Local "Association to discuss the matter." The second modification relates to the rating of workmen, and it runs as follows: "Employers shall be free to employ workmen at "the rates of wages mutually satisfactory. They do not "object to the Unions, or any other body of workmen, in their "collective capacity, arranging amongst themselves rates "of wages at which they will accept work. But, while "admitting this position, they decline to enforce a rule of "any society, or an agreement between any society and "its members. The Unions will not interfere in any way "with the wages of workmen outside their own Unions. "General alterations in the rates of wages in any district

" or districts will be negotiated between the Employers' " Local Association and the local representatives of the " Trade Unions or other bodies of workmen concerned." These are the considerable modifications claimed by the " Daily News " as the fruits of the week's discussions.

Here the matter stands. The view of " The Times " is that the issue rests precisely where it was before; and this is the common-sense opinion. The question of hours remains. The men's representatives offered to take a 51-hour week—the time to be saved being the abolition of the breakfast interval. But the proposal was found to be impracticable. Then they offered to let the question of working hours be deferred for six months—to refer it to arbitration—anything so that they might not go to their suffering constituents empty-handed. The definite reply of the employers was that they " cannot entertain or agree " to any reduction of the hours of labour." Thereupon the delegates declared that they must refer the question to another vote. The result will, of course, depend upon the manner in which the question is put; and this will be governed by what the Trade Union officials think of the situation.

The supplementary interest of the dispute has been well maintained by the usual amount of letter-writing in " The " Times," and articles in the newspapers and technical journals. It is quite impossible to keep account of all the suggestions and criticisms that see the light in this way. Colonel Dyer explained the employers' position in a speech delivered at Manchester, the conclusion of which was that not business, nor solicitude for the workman, but Socialism was at bottom of the trouble of the engineering trade. The men who demanded a 48-hour week had never even considered how it would work all over the country. The Bishop of Hereford wrote a long letter, the burden of which was that, when workmen formulate claims and offer to submit them to arbitration, those employers who refuse to accept such an offer " put themselves in the wrong." Moreover, the Bishop thought that any three British Judges could have disposed of the engineering dispute in no time—British judicature being notoriously swift, certain, and economical. Mr. George Livesey replied to the Bishop of Hereford in the terms of the reproof administered to the late Cardinal Manning upon the occasion of the interference of this by no means retiring ecclesiastic in the London Coal Porters' strike of 1889. He blandly assured the Bishop that, like the Cardinal, " he " did not know what he was talking about ; " while other critics also asked his Lordship how his three Judges were to enforce their decrees against a Trade Union. Mr. W. Bramwell Booth played up to the Bishop; lauding his Lordship's " desire to appeal to large moral considerations." But there is a very old saying that " soft words butter " no parsnips ; " and the men who have to pay wages know best whether they are getting value for their money, and, if not, why not. Set a whole bench of Bishops, another bench of Judges, and all the " public opinion " of the world, against a disaffected shop full of men—can the one group of forces compel the other to work to good purpose? It is sufficient reply to the Bishop of Hereford to remind his Lordship that his experiment has been tried in all essentials, in what is known as the Plate Glass Bevellers' case. There the Court solemnly condemned the Union; and they might as well have undertaken to " hit the nominative case with a stick." The employers lost £2000 in cash; and now the Union Secretary goes about to Trade Union Congresses boasting of the futility of the hostile judgment of the Court.

The Judgment in "Allen v. Flood."

At last the judgment of the House of Lords has finished the case of *Allen v. Flood;* and public opinion is free to exercise itself upon what has come to be regarded as in some respects a test case of the legality of a particular " Trade Union principle." As not uncommonly happens, public opinion has to some extent gone wrong over the scope and meaning of the judgment. Everybody knows the facts of the case, which are as simple as the questions of law they raised have proved to be puzzling and disputable. It will be as well to recall the story. A Trade Union delegate told the employers of two shipwrights that unless the men were discharged all the boilermakers would leave work. The men were turned off in consequence of this representation; and they brought an action against the delegate for maliciously causing them to lose their employment. They were employed by the day; and the employer was perfectly within his right in paying them off at the end of a day. The Judge who first heard the case left to the jury the question of " malicious " inducement " to discharge the men; and they answered that there was malice. The case was appealed; and three Judges of the Court of Appeal upheld the judgment. It was carried to the House of Lords, and twice argued—the second time before eight Judges called in to advise their Lordships as to whether on the evidence there was any cause of action. Six Judges answered in the affirmative, two in the negative. Now a large majority of the Law Lords have declared that these two Judges were right and the ten Judges of a contrary way of thinking were wrong.

Immediately the nature of this particular judgment was known, some newspapers jumped to the conclusion that it was a most unfortunate result, and that its practical effect would be to support such oppressive practices in the name of Trade Unionism as that of which the delegate Allen stood confessed. Really, however, the judgment of the Law Lords has gone upon another order of considerations altogether, far removed from the doings and designs of any particular individual. The question of malice, or motive, had been imported into the case; and this stuck in their Lordships' throats. Lord Watson, who led the majority of his colleagues, could not accept the proposition that the law of England takes into account motive as constituting an element of civil wrong. He said: " Any invasion of the civil rights of another person is in " itself a legal wrong, carrying with it liability to repair " its necessary or natural consequences, in so far as these " are injurious to the person whose right is infringed, " whether the motive which prompted it be good, bad, or " indifferent." So his Lordship deprecated the introduction of the word " maliciously " into the reference to the jury in this case; the word having a meaning accurately known to the law, and also another less precise popular meaning which a jury would be more likely to understand. Lord Shand was even more emphatic. He found there was no breach of contract. " The employers' act in dis- " pensing with the services of the plaintiffs at the end of " any day was a lawful act on their part. The defen- " dant induced them only to do what they were entitled " to do; and in the absence of any fraud or other un- " lawful means used to bring this about, the action fails." Lord Macnaghten strongly denied the proposition that a person who suffers loss by another person's legal action or inaction can go behind the legal act and have a remedy against a third person who, albeit maliciously, procured the commission or omission of the act. Lord Macnaghten thought these questions belong to the realm of morals rather than law. So stands the law in *Allen v. Flood;* and the only thing to do now is to make the best of it.

The Lord Chief Justice on the Law of Libel.

Last Thursday the Lord Chief Justice, sitting in his Court, said something about the law of libel and libel cases which has been received with a feeling of satisfaction almost too deep for words by the whole British newspaper press. " There is no more valuable remedy," said Lord Russell, " to protect the public than the law of libel, and there is " no law more susceptible of abuse than that law." The occasion was an altogether exceptional one. Three newspaper libel cases of a trumpery character had occupied the attention of the Court; and all the plaintiffs had failed to establish their claim to the protection of the law. After all this futile business had been gone through—unhappily, at considerable expense to the parties—the Lord Chief Justice " delivered his soul " in the observation recorded above. It is to be hoped that the lesson will not be thrown away. As " The Times " pertinently remarks, it is high time that some check should be put upon the victimizing of the Press by setting in operation the law of libel. This is a matter in which not only the interest of newspaper writers and proprietors is involved, but which touches very closely the greater interest of public morality. It is manifestly for the public good that those who circulate statements injurious to individuals should be held responsible for the consequences, whether the procedure takes the shape of newspaper publication or any other form. There is far too much in the modern newspaper press of the vulgar and offensive " personal " style of journalism; and it is highly desirable that this degraded

stuff should be kept as harmless as possible by wholesome dread of the law of libel. Respectable journals do not wish to be excused from the punishment due to scandal-mongers in general; but they have a legitimate grievance against the system under which they are exposed to be sued for damages in respect of alleged libels upon persons who in the majority of instances are not worth "powder "and shot." Upon this head "The Times" observes: "It is a well-known fact that many newspapers prefer to "compromise manifestly absurd or iniquitous claims of "this character rather than to engage in a litigation with "a man of straw, probably the puppet of a speculative "attorney." Meanwhile, the fear of the law keeps the honest newspaper, which knows the facts, from exposing the machinations of many a swindler. Journalism cannot afford to be candid. The proceedings in the Lord Chief Justice's Court on Thursday may impose a slight check upon reckless actions for libel, by enabling solicitors to dissuade touchy individuals from taking proceedings which could only be expected to cover the complainant with ridicule. But the worst evil will remain, inasmuch as no *obiter dictum* of a Judge will serve for a defence against blackmailing actions, which may never be meant to get so far as a hearing. Every public journal is exposed to the "baseless demands of speculative litigants without the "means of paying anything whatever in case of defeat;" and how to protect honest journalism against this hazard might profitably engage the attention of Parliament. If would-be plaintiffs against newspapers were compelled to obtain permission to proceed from a Judge in Chambers, the evil might be checked; there is no knowing. These reforms of legal practice have a lamentable way of turning out wrong.

The Legitimate (?) Action of Trade Unions.

Those good and well-meaning people who, not being in business themselves, write to the newspapers professing their inability to understand why employers of labour evince so strong a reluctance to "recognize the Trade "Union," or accept the Trade Union principle of "collec-"tive bargaining," would be enlightened if they would take note of such illustrations of the working of these principles as we give in our "Correspondence" column to-day under the above heading. Letters dealing with the same matter, addressed by two firms to the Editor of the "Ironmonger," are also given for the sake of completing the picture. Our own correspondent points out that, according to the Trade Union view of the respective provinces of gas-fitters, carpenters, plasterers, and bricklayers, a representative of each one of these trades, with his attendant satellite, must be sent to every job which involves lifting a floor-board, cutting a chase, and making a hole in a wall in order to effect a gas connection. The best thing he can do, when next a local newspaper proprietor or popularity-seeking magnate wants a job of this kind done, would be to send the whole team, and charge accordingly. There is a wonderful amount of human nature in man; and the instant a professed "Friend of Humanity" discovers what Trade Union principles mean when applied to his own pocket, he will doubtless repeat the observation of his prototype to the "needy knife-grinder." The Nottingham example is almost grotesque in its logical completeness. One feels that it would be a great pity to spoil it by comment. The victimized firm want to know the views of gas engineers on the subject; but we fear that if these were communicated to us they would be unfit for publication in our pages.

A Sound Popular Account of Coal Gas.

Reference was made in this column last week to the silly stuff that passes for popular science in the ruck of modern "home" periodicals. It is only fair that we should recognize good work of the sort when we see it; and it is a pleasure to be able to record that in a recent number of that old favourite of "home" readers, "Chambers's "Journal," there appeared a thoroughly sound article on "Gas Enrichment," which in reality covers a much wider ground, and does it very well. The writer assures the gas consumer that generally, when he grumbles at the bad quality of the gas supplied to him, "the fault lies at his "own door in the shape of badly-designed fittings." Exception might be taken to this observation that, as a matter of fact, the defect is usually inside the door, rather than "at" it; but that is a detail. The writer has an intelligent view of the value of enrichment as practised in connection with the manufacture of ordinary coal gas; and he applauds the use of carburetted water gas for this purpose. He looks forward to the time when a more general use of improved burners will render the enrichment of coal gas unnecessary; but in the meanwhile he knows where to go for information as to the best way of effecting this object—quoting with appreciation from the Inaugural Address of the President of The Gas Institute at Bath. This is as it should be; the pity is that more writers on scientific and technical topics for popular reading do not prepare themselves for their task in the same way. As it is, the community are divided, with regard to such matters, into the two orders of those who know all and those who do not know anything about them; and the links between these orders of people are few and weak. The opportunities of swindlers, to take only one view of the situation, would be greatly diminished if popular science and technology were more accurate.

WATER AND SANITARY AFFAIRS.

Mr. H. L. Cripps was again before the Royal Commission on the Metropolitan Water Supply last week, making his third appearance. As usual, he was historical, but some of his statements, as indicating the policy of the County Council, were interesting, and perhaps important. After much had been said on the subject of control, Mr. Cripps was explicit enough to state that he appeared before the Commission as representing the Council, and was authorized to speak on behalf of the Water Committee. He explained that the difficulty which the Committee had felt about the question of control was that they were desirous of attaining a final settlement of the whole of the Water Question; and, as at present advised, they did not see how a system of control would accomplish this end. Later on, he said he could suggest no other form of control save in the sense of ownership. As bearing on the Welsh project—though that was not named—Mr. Cripps failed to see how it was possible for anyone to offer an independent water supply to the Metropolis, unless coupled with a scheme for purchasing the undertakings of the Companies. He wished he could find that it was possible to sever the two things, "because "nothing probably would be so advantageous to the "ratepayers." At the same time, he admitted that such a scheme would be "very hard on the Companies." In his opinion, "all difficulties would be got rid of by purchas-"ing the undertakings." Concerning the existing supply, Mr. Cripps said no one suggested that it was too little for present needs; but the advice given to the Council showed that it was necessary to make more provision for the future than was contemplated even by the Companies themselves. We must suppose that Mr. Cripps would go beyond the recommendations of Lord Balfour's Commission, which is not exactly what Lord Llandaff and his colleagues intend. In connection with a remark made by Mr. Cripps, General Scott asked whether the County Council had not power, under the Metropolis Water Act of the past session, to deal with complaints by consumers without bringing in a Bill. Mr. Cripps admitted that such power was given; and he went on to say: "In fact, the County Council "are considering what to do under the Act." Perhaps a certain amount of light is thrown on the designs of the Council by the statement of Sir Henry E. Knight at the meeting of the Southwark and Vauxhall Water Company, to which we offer some allusion farther on, relative to certain "emissaries." With respect to the evidence of Mr. Cripps before Lord Llandaff's Commission, it is amusing to find our contemporary "London" virtually confirming our remark of last week, that the result of this gentleman's appearance before the Commission had been to bring out more clearly than ever the fallacies lying at the root of the Council's pretensions in respect to the water supply. "London" puts the case thus: "All the Chair-"man's questions to Mr. Cripps tend to produce points more "or less in favour of the Companies." These points exist, otherwise they could not now be produced. "London" is "not sanguine that much good" will come from the Commission. This means, we suppose, not much harm to the Companies. Lord Balfour's Commission failed to please the Council; and the same is now apprehended concerning

the Commission under Lord Llandaff. Had the Council a better cause, they would be less unfortunate.

In the course of his address at the half-yearly meeting of the Southwark and Vauxhall Water Company last week, Alderman Sir Henry E. Knight made reference to the important Bill which has been prepared for introduction into Parliament by the Company next year, according to the arrangement made with the approval of the Select Committee which dealt with the Company's Bill of last session. The coming measure, designed to legalize such an agreement with the Thames Conservancy as shall provide an adequate supply of water for the Company's district, is nevertheless destined to encounter what Sir Henry Knight very justly describes as the "virulent "opposition" of the London County Council. It is a serious indictment to make—but there is only too much warrant for it—that the Council have no care for what may happen, so that they may but "damage the Water "Companies and buy them up cheaply." Proof that a certain quantity of water is necessary to meet the requirements of an immense population goes for nothing as against a determination to frustrate every plan by which a Company may hope to fulfil their functions. The mode in which the Council are seeking to take advantage of the Metropolis Water Act affords a further instance of the spirit of hostility towards the Companies. According to Sir Henry Knight, the Council have sent "emissaries" throughout the whole of his Company's district and that of the Lambeth Company, in order to incite the consumers to complain of something wrong in the water charges. But they have entirely failed to discover any cause of complaint, though, on the other hand, some of the consumers have expressed dissatisfaction with the proceedings of the "emissaries." It seems scarcely credible that a great public body, aspiring to be "a little "Parliament," should stoop to such a miserable emulation of the spy system. Certainly the Legislature never contemplated such an exercise of the power given to a local authority to take up the complaint of a consumer. Speaking of the Royal Commission under Lord Llandaff, Sir Henry mentioned that one subject for consideration was that of connecting all the systems of supply. He explained that the Companies would not make the smallest difficulty on this point, and had already submitted a very simple plan for connecting all the undertakings throughout London. It is undoubtedly wise to make this concession to public feeling, and perhaps it may be said in some degree to meet the demand of the County Council for "consolidation." In a painstaking speech, Sir Henry Knight dealt with a number of details chiefly of value as between the Directors and the shareholders. We regret to find one of the latter making remarks of so irrelevant and disrespectful a character affecting the Chairman and the Board as to afford ground for Dr. Chesshire's suggestion that the speaker might be taken for a County Council "emissary." The insinuation made as to "secret service "money" was utterly absurd; and we are glad to find the Chairman indignantly declaring every charge that had been brought forward to be "utterly unfounded." It has to be observed that the accusations proceeded from a solitary individual, and received no countenance from the other proprietors.

The half-yearly meeting of the Chelsea Water Company last Thursday, presided over by Sir W. H. Wyatt, was at once brief and satisfactory. There was a larger income, and no increase in expenses. There was a dividend of 10 per cent., and something over, with £2000 transferred to the contingency fund, so as to cover the heavy expenses likely to arise in connection with the Royal Commission. The Deputy-Governor, Mr. F. S. Clayton, cited official testimony as to the purity and excellence of the water supply. Of course, this approval extends to the supply furnished by all the Companies. It is only to be hoped the public understand that the analyses are to be relied upon as thoroughly independent of any influence exercised by the Directors or their officers. As Mr. Clayton well remarked, the Companies have nothing to do with these analyses except—in the case of Sir W. Crookes and Professor Dewar—to pay for them.

The controversy between the County Council and the Thames Conservators as to the alleged pollution of the Thames has lately concentrated itself on the question of the barges, and the Conservators acknowledge that in a particular instance a barge which one of their officers stated contained "ashes only" really carried something worse; so that in future they mean to have the barges more carefully looked after. The General Purposes Committee recommend that the Council at their meeting to-day should express their "unabated confidence" in Mr. Idris as one of their representatives at the Thames Conservancy Board. The Rivers Committee, of which Mr. Idris is the Chairman and Mr. Steadman the Vice-Chairman, have prepared a report, to be brought up at the Council meeting to-day, stating that the contributions levied upon the Water Companies for the present year "amount to no less "than £24,215." As there is a balance of income over expenditure to the extent of £13,500 with respect to the Upper Navigation Fund, which it is proposed to transfer to a reserve fund, the Committee suggest that either the duties cast upon the Conservators by the Act of 1894, with respect to the further purification of the Thames, are "far less costly" than was expected, or the administration of the Act is not so complete and adequate as it might be, having regard to the income of the fund. It is argued that the contributions of the Water Companies are indirectly paid by the consumers. Of the direct payment there can be no doubt; of the indirect, less certainty.

The "Transactions" of The Gas Institute for 1897.—We have received the volume of "Transactions" of the Incorporated Gas Institute for the present year. It contains the report of the proceedings at the meeting held at Bath in June, together with the lists of members and the other matter usually accompanying the report. The papers are illustrated by several folding plates; and the subject-matter index has been brought up to date. The book has been produced under the editorship of the Secretary of the Institute (Mr. Walter T. Dunn).

The Intellectual Accomplishments of the Past Half Century.—In a discourse recently delivered in commemoration of the Jubilee of the Sheffield Scientific School of Yale University, President Gilman remarked that perhaps the greatest triumphs of the intellect during the last half century are the following contributions to human knowledge: The establishment of the principles of evolution and of the conservation of energy; the development of mathematical science, and its application to physics, mechanics, electricity and astronomy; the development of spectrum analysis, and the consequent discoveries respecting light and electricity; and the discovery of the nature and functions of bacteria, and of their influence upon living organisms.

Society of Engineers.—The annual general meeting of the Society (the forty-fourth) was held on Monday last week—Mr. G. M. Lawford, the President, in the chair—for the purpose of appointing the Council and officers for the ensuing year. The following were elected by ballot: President, Mr. W. Worby Beaumont; Vice-Presidents, Messrs. J. C. Fell, H. O'Connor, and Charles Mason; Ordinary Members of Council, Messrs. J. P. Barber, Joseph Bernays, George Burt, D. B. Butler, Percy Griffith, Richard St. G. Moore, N. J. West, and Maurice Wilson; Honorary Secretary and Treasurer, Mr. Perry F. Nursey; Hon. Auditors, Messrs. Alfred Lass and Samuel Wood. The proceedings terminated by a vote of thanks to the President, Council, and Officers for 1897, which was duly acknowledged by the President. The annual dinner of the Society took place at the Hotel Cecil on Wednesday.

The Experimental Work of the Massachusetts State Board of Health.—Reference has been made from time to time in our columns to the important experiments in connection with water purification carried on by the State Board of Health of Massachusetts. The report of the Board for the past year has lately been issued; and we find therefrom that the filters continue to act efficiently. The attention of the Board has been directed to the presence of iron in public water supplies; and the results of special experiments undertaken on this matter go to show the great value of coke breeze as a filtering material. The use of polluted water from ponds in places of summer resort within easy distance of large cities, with the attendant liability to the dissemination of typhoid fever has also been carefully investigated. We hope to notice these matters at greater length in a subsequent issue.

Award in the Cowes Gas-Works Arbitration.—Mr. Shiress Will, Q.C., the Umpire in the arbitration to fix the price to be paid by the Cowes District Council for the undertaking of the Cowes Gas Company, has just issued his award. The arbitration proceedings were reported in the "JOURNAL" for Nov. 2. The price asked by the Company was £62,000; while the value as calculated by the Council's representatives was only £32,000. The Umpire has awarded £52,150 and the agreed cost of obtaining the Company's Act—£2409. The decision carries costs against the Council. A second reference to the Umpire, on a question of title raised by the Council, was also made; but the award on this point is that the first award is unaltered. The Council will have to pay in addition the costs of their unsuccessful opposition to the Company's Bill of 1896, and those incurred in promoting the Act authorizing them to purchase.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1358.)

Business could not, as a matter of course, be expected to be anything but inactive last week; it was quiet indeed. But notwithstanding this, the general characteristic was marked firmness, almost every department gaining some advantage. The improved aspect of the labour dispute had much to do with this where trade and traffic were concerned. The settlement engrossed more attention than fresh business; and no difficulties cropped up. The Money Market was very strong; and there was a good demand for the purposes of the settlement. Firm rates are fixed now to last the year out; but how much longer is not so clear. Business in Gas shows a seasonable falling off in point of volume; transactions tailing off especially light as the week approached its close. The general characteristic was steadiness, with here and there some moderate advance in value. A good many debenture stocks were quoted *ex div.* on Thursday; and they all go up a point or two in the change. Gaslight "A" was quieter than it has been for some time. It was a little uncertain at first; and on Wednesday it was done once at 312½. But it very quickly rebounded; and the closing mark on Friday—315—was the best of the week. The quotation thus remained unchanged. A fair amount was done in the secured issues of all sorts; but they did not vary, and gave no sign. South Metropolitan was lightly dealt in every day at about middle figures—closing firm. Two or three bargains were marked in Commercials at good level prices. The Suburban and Provincial division provided a little more business than of late; and some nice prices were realized. British and Alliance both had slight rises in quotation. The Continental Companies were brisk, especially Imperial, which was in good favour, and advanced by several steps until it had gained five points. Union is only one lower; the reduction in the dividend causing no alarm. None of the rest made any sign, except Buenos Ayres, which was fractionally easier. Business in the Water Companies was very light; but the tendency was very firm all round. Several issues (ordinary and secured) were quoted *ex div.* on Thursday, and nearly all come out the better for it.

The daily operations were: Business in Gas was moderate only on the opening day; but the tendency was decidedly stronger, though quotations did not move. Tuesday's transactions were lighter still; and again no change was made in the figures. On Wednesday, there was some promise of a little more activity; but it did not amount to much. Imperial Continental improved 2. Thursday's business was only moderate; but prices in general were very good. Imperial Continental rose 1; and British, ½; but Buenos Ayres fell ¼. Several *ex div.* variations were in favour of higher prices. Friday fell very quiet again; and the only change was a rise of ½ in Alliance and Dublin. On Saturday, hardly anything was touched, except Imperial Continental, which improved 2 more.

ELECTRIC LIGHTING MEMORANDA.

A Report on Incandescent Gas-Burners—A Belated Estimate—No Controversy—The Business Aspect.

The subject of incandescent gas-burners possesses a painful interest for the partisans and followers of the electric lighting industry. There can be no question as to the seriousness of the obstacle presented by gas-burners of this type to the extension of incandescent electric lighting all the world over. They place at the disposal of the public an alternative to the electric lamp which is always ready to hand, which is a newer thing than the electric light itself, and can be taken advantage of without trouble and to any desired extent. Moreover, the incandescent gas-light is far and away the cheapest source of artificial light in the world; while incandescent electric light is the dearest. If it is allowed that the latter possesses peculiar virtues and attractions of its own, these must be paid for. All this is never far away from the thoughts of electrical engineers, who see in the town districts wherein their own chief business lies, shop after shop ablaze with the burner that has rehabilitated in public favour the once-despised gas. We do not hear so much now in "electrical circles" about the pending extinction of the gas industry. The future of the industry does not depend upon the incandescent system of lighting; but it is this system which hits the electric lighting interest hardest, simply because it beats the incandescent electric lamp in brilliancy and price. It is not to be wondered at, therefore, that our electrical contemporaries should try their utmost to disparage their detested rival. A recent issue of the "Electrical Review" contains what is advanced as a damaging exposure of the weakness of "incandescent gas mantles." This is in the form of a report upon tests made by Mr. E. A. Medley, one of Professor Ayrton's old Central Technical College students; and the results are rapturously hailed by our contemporary in a leading article as "something in the nature of a revelation even to the incandescent gas companies."

We notice this report and article here because we would not lay ourselves open to the reproach of shirking what is meant to be painful reading for gas engineers. We pass over the artless suggestion that Mr. Medley's results are "something in the nature of a revelation" to incandescent gas lighting experts. It may be taken for granted that these specialists have no need to go to the Central Technical College for instruction upon the merits or imperfections of their systems of obtaining light from gas upon the incandescent principle. Mr. Medley himself seems to assume a "superior" attitude, and begins his report with the observation that "the growth in the use of the 'incandescent' system of gas lighting during the last few years has made the necessity for an inquiry into the efficiency of this method of obtaining light a matter of considerable importance, both to the general public, and also to the electrical profession; for the rapid strides made by this new illuminant render it a possible serious competitor with the electric light." This ingenuous writer is just a little late. He should have taken the job in hand before the possibility he confesses had become the actuality so many of his electrical friends have reason to deplore.

We do not propose to go through Mr. Medley's results in detail. Those of our readers who wish to do so will find the report in the "Electrical Review" for the 10th inst. We have little fault to find with Mr. Medley's methods or his statements. His work is a good indication of the care with which students of the Technical College are trained to observe and record. His experiments show that the light given by incandescent gas-burners sometimes varies unaccountably, and that the duty of all mantles falls with use. There is no "revelation" in this. With regard to the extent of the deterioration found by Mr. Medley in different examples, we must beg to be excused from saying anything—not that there is anything alarming in his figures, or anything to prove that the incandescent system has gained the public favour upon false pretences, but simply for the reason that we have no relish for the prospect of such a controversy as the reproduction of these statements here would originate. So many commercial interests would be affected by the publication, that the scientific value of Mr. Medley's work would be insufficient to compensate for the disturbance. All sorts of side issues would be raised; and in the end no good would have been done to anybody. There is but one criticism that we have to offer upon Mr. Medley's tests for illuminating power. They were, he says, made in Berlin; the standard of light being the regulation German Hefner-Alteneck amyl-acetate lamp. We should have thought this about the most unsuitable of all possible standards with which to compare a Welsbach light, on account of the wide difference of colour. The comparison of the two lights may be easier in a Lummer-Brodhun photometer than would be the case in the form of instrument commonly used by English gas engineers; but the lurid light of the amyl-acetate flame must always be an objection to its use for measuring a white light.

It is undesirable to follow Mr. Medley through his prognostications of what is going to happen to the financial incandescent light interest when the Welsbach master-patent expires. The consideration of this question of private interest is altogether foreign to the general problem of how the prospects of incandescent electric lighting are likely to be affected when, as Mr. Medley anticipates, "this country will be flooded with mantles 'made in Germany' and elsewhere." He even says that some of the German imitations are as good as, or better than, the original article; and he is confident that the price of mantles must go down. He has bought them in Berlin for less than 4½d. each. This is a bad look-out for the incandescent electric lighting interest; for he admits that "the mantles give a wonderfully good light when new," and when renewals become only a matter of a few pence, it will go hard with any rival system. Of course, incandescent electric lamps are not immortal; but that is another story. In its editorial comment upon Mr. Medley's report, our electrical contemporary waxes enthusiastic over the figures; but it strengthens our desire to avoid controversy upon the subject by going off at a tangent to attack something that was reported in a newspaper "interview" concerning the cost of lighting a Swansea Church. This is a glaring example of the tendency of discussions upon these matters to get off the direct line; and we do not intend to lend the columns of the "Journal" to any vagaries of the kind. The conclusion of the whole matter is obvious enough. Incandescent gas lighting may not be an ideal illuminant. We at any rate have never claimed such quality for it. This form of illusion is more often met with among the partisans of electric lighting than among the friends of the humble, necessary gas. But, whatever electricians and students of physics may say about it, the incandescent gas-light has "come to stay;" and its credentials lie upon the surface. So do the qualities of the incandescent electric lamp; and the two rivals for public favour will have to fight it out upon business, not scientific, lines. When affairs attain this stage, the "revelations" of the laboratory, if they do not disclose fraud or false pretence, become of mere academic interest.

The Coze System in France.—According to "Le Gaz," a company has just been formed in Paris for working the Coze inclined retort system. Though this method of carbonization has found favour in England, America, and Germany, it has not been much adopted in France, its birthplace. It appears that efforts are now being made to remedy this state of things.

AN AMERICAN CONVENTION ON MUNICIPAL GOVERNMENT.

It has already been recorded in the editorial columns of the "Journal" that during the past autumn two somewhat remarkable "Conventions" were held in the city of Columbus (Ohio). One of these was styled the First National Convention of Mayors and Councilmen; the other proudly vaunted itself in print as the Second Annual Convention of the National Street Lighting Association. The proceedings of these meetings were reported at full length in "Progressive Age;" and both possess, in parts, sufficient general interest to warrant our noticing them in some detail. In certain respects, the concerns of the two gatherings were practically the same. One convention was understood to be composed of men prominent in American municipal life, and interested in the cause of good city government. The other was occupied with a class of problems that really constitute a branch of the former concern, and should in strictness be covered by it. If, therefore, the Mayors and Councilmen mean to continue their convention, those who have preceded them in erecting the machinery of a Street Lighting Convention may advantageously allow themselves to be absorbed in the body which has the larger scope, and should occupy the more commanding position. This, however, by the way. The first reflection that occurs to an Englishman not wholly unfamiliar with the aims and methods of local self-government at home, upon hearing of these conventions, is that it is high time, by all accounts, for United States townspeople to "take a thought and mend" their municipal ways. There is no need to mince words on the subject. The prevailing English opinion respecting what has been reported here as being the state of municipal government in the United States, is that for some reason the much-belauded American Constitution has utterly failed to provide for the efficient, economical, honest administration of local affairs. If, in addition, the Englishman knows anything of gas supply, he will also cherish the impression that this is a business which the people of the United States, in their corporate capacity, do not properly understand.

It is known, however, that of late years an uneasy sense of the national deficiencies in these respects has been created in the minds of a thoughtful minority of United States citizens. Spies from beyond the Atlantic have been among us and upon the Continent, taking note of the way in which the cities of the Old World are managed; and their reports have had some effect in making well-meaning municipal America ashamed of itself. It seems to have occurred to the Editor of a publication called "City Government" that it would be a good thing to get together as many honest Mayors and Councilmen as could be persuaded to make the pilgrimage to Columbus, in the pleasant autumn weather, for the express purpose of talking over the municipal position. The idea was an excellent one; and the realization was as promising of better things by-and-bye as could have been expected.

Let us consider for a moment the vast difference existing between a municipal system in the United States, and that which prevails under any of the compact, centralized Old World National Governments. In the United Kingdom, for example, the attributes, the scope, and the general policy of local self-government are perfectly well understood by everybody concerned. And however important, wealthy, and energetic a local governing body may be, over it is the Central Executive to keep it upon the working lines laid down by Parliament. Behind all is Parliament itself, open to all applicants for relief from disadvantageous legislation, or for further statutory powers. This means that in this country local self-government must go forward by the Queen's highway. The rate of progress, and the degree of comfort to be enjoyed during the journey, are matters of local choice or resource; but the course is marked out and the way is clear. In the United States all is different. Under the independent domestic laws of the States of the Union, local self-government has developed in a happy-go-lucky fashion that serves well enough where there is not much at stake, but breaks down lamentably where the control of local affairs is a serious matter. There is no Treasury, no Home Office, no Local Government Board, no Board of Trade, as we have these institutions in England. Consequently, those Municipalities that truly desire to serve their public loyally are left to their own devices and the prompting of the ratepayers; and those that are differently inspired are left without check to follow their evil courses. As was shown the other day in the New York mayoral election, a popular vote is no safeguard of municipal morality.

The First National Convention of Mayors and Councilmen of the United States resulted in the formation of a League of American Municipalities, composed of representatives of a considerable number of local authorities scattered over all the vast territory of the Union. This latter circumstance is obviously a source of weakness. Another is the smallness of the towns that were represented. Of course, there is no Mayor of New York in "this galley;" but there is nobody from any larger community than New Haven or Wilmington. This is probably due to the reassuring fact that the gentlemen who are associated with the administration of the smaller United States Municipalities are more like those whom we are accustomed to see in corresponding positions at home—that is to say, they are good citizens, and men of substance and credit. On the other hand, the head men of the large United States cities are mostly of the professional politician class, who are in office for the "spoils," and care nothing for the cause of good government—which is, in point of fact, the enemy of all such parasitic growths on the body politic. It will be a long time, we fear, before the League of American Municipalities will attain to such a character of membership as that exhibited by our British Association of Municipal Corporations. Not that we desire to depreciate it on account of its small beginnings—far from it. We hold that the public spirit which has set itself to so arduous a task as the introduction of system, order, and efficiency into the government of United States towns is most praiseworthy. Everything must have a beginning, and it will be a subject of universal congratulation if the Municipal League which has been born at Columbus, should worthily extend operations from New York to San Francisco and from Chicago to New Orleans before it has done; but the odds on the other side are fearfully heavy.

To the sober English taste, the proceedings of the Ohio Convention were marred by the flood of talk, to little or no meaning, in which the genial company engaged for three whole days. There was a vast amount of inconclusive chatter and playing at parliamentary business; and many of the papers that had been procured for submission to the convention were of the nature of personal and trade advertisements. These weaknesses were perhaps unavoidable in the circumstances; yet it is painful to wade through the morass of verbiage only too faithfully reported by our American contemporary, in search of the infrequent idea and the absent suggestion. The convention seemed incapable of coming to close grip with the fundamental questions of city government all the world over; while upon those of peculiarly native origin it was ominously silent. One of the problems that actually engages American local governments just now is whether it is preferable for Municipalities to light their streets themselves or put the work out to be contracted for; and the Hon. John MacVicar, Mayor of Des Moines, Iowa, read a paper on the subject which began with the case of Ancient Rome and wound up with a lesson borrowed from Chicago. It is impossible to treat this problem as a general one, though American opinion seems to believe that a general solution must exist, if only the fundamental factors could be ascertained. Here, of course, is the chief difficulty. The Mayor of Des Moines was speedily compelled to abandon the general for the particular in his treatment of the question, and he related the experience of the city in the matter of lighting. There were four lighting companies, gas and electric, in business in the district, which was yet insufficiently lighted. The local price for all-night electric arc lamps was $126 per annum; for 16-candle power gas-lamps, $18 per annum; and steam coal cost from $0·65 to $1 per ton delivered in the town. These charges can hardly be called excessive. Indeed, the Electric Light Company that had been supplying the arc street lamps was in liquidation. The history of this undertaking is an instructive illustration of that American "progress" in electric lighting which has been so often held up to the admiration of the benighted Britisher. It was started, like many others, by a "parent manufacturing Company," who bound the filial undertaking down to trade mainly for their benefit. As a result, "the greed of the parent Company to get all the money possible from the local Company for electrical machinery, on their advice, and the combined lack of engineering knowledge of both concerns, caused the local Company to buy cheap and inadequate machinery, which in a short time was not fit to adorn a respectable scrap-heap. Additions to the plant were soon demanded by the growth of the business; then the building, boiler plants, &c., were added to and patched, which again decreased the original low efficiency of the plant. Upon all this deplorable investment, the contract with the city for street illumination was expected to pay a dividend." This is the sort of thing which the Electric Lighting Acts were intended to avoid for this country. Obviously, the cause of private ownership of lighting plants is not advanced by such examples as the foregoing.

With regard to the local gas supply, his Worship of Des Moines was delightfully naive. "We had some experience," he said, "a short time ago in an attempt to regulate the rates to be charged for gas. We were paying $1·75 per 1000 for gas illuminating, and $24 per annum for street-lamps. We thought $1 would be a reasonable rate for gas." Observe, there was no question here of how the Gas Company were faring—what dividend they were paying, or anything of the kind. Upon the vague desire for "dollar gas," the community went to law with the Company. After six months' active litigation "a compromise was effected at $1·30 per 1000 for illuminating or fuel, and $17 or $18 per year for street-lamps, with an agreement for a natural reduction; so that at the end of twelve years we will have $1 gas." Not a hint is offered from which one might form an opinion as to whether or not this is a fair settlement. It is all a matter of bargaining, from which recognition of the true principles governing the price at which gas can be sold in a particular locality is absent. The Mayor then tried to obtain information regarding the economies of electric lighting from the big parent Companies, with a view to putting down a municipal plant; but he found it impossible to get what he wanted. Eventually the city went into the matter independently of these Companies, and arranged for a public street-lighting plant. In the course of the discussion on the paper, it was generally admitted that the question of the expediency

of municipalizing a lighting plant was mainly dependent upon the character of the leading men in the municipal body.

The most important contribution to the transactions of the convention was a paper by Mr. A. R. Foote upon "The Cost of Service to Users and Ratepayers," which, being interpreted, means a method of comparing the working of public and private gas, water, and electricity supply works. This was an elaborate composition, which eventually placed upon record some very pertinent conclusions amounting to the same principles that have long been recognized in English practice. The author showed that the cost of production is the correct measure of the price at which gas, water, and electricity can be sold in any locality. "Experience gained demonstrates the fact that the principles and methods of competition cannot be applied to public service industries. They must be protected and regulated as monopolies. . . . Those whose only desire it is to secure the best services at the lowest price for users and taxpayers, will see that their object can be gained in the way indicated." It is satisfactory to learn that the United States Department of Labour has undertaken a systematic investigation of the subject, with the object of instructing the people in the correct principles of regulation of water, gas, and electricity supply. The convention is to meet next year in Detroit; and by this period it is hoped the members of the organization will have a better knowledge of the character of the work they have undertaken to perform.

OBITUARY.

William Wood.

It is with sincere regret that we have to record the death, yesterday week, of Mr. William Wood, who for the last seven years had been the Gas Engineer to the Bradford Corporation. He had been suffering from a severe illness for about three months; and despite visits to health resorts and the attention of his medical adviser, he had been unable to throw off the disease. Mr. Wood was born in 1833, at Bury, in Lancashire, and was the son of a cotton manufacturer. He served his apprenticeship at the large engineering works of Messrs. Walker, at Bury (being there at the same time as Mr. T. Newbigging), became their chief draughtsman, and carried out many important works for various gas and water companies in the North of England. He was for several years Manager of the Cambridge Gas-Works; and afterwards became Engineer and Manager of the gas and water works at Barrow-in-Furness and at Birkenhead. In 1880 he became Assistant-Engineer at Bradford; and upon the retirement of the late Mr. David Swallow in 1890, he was appointed Engineer and Manager. Of an obliging and quiet disposition, Mr. Wood gained many friends among those with whom he was brought in contact; and he was held in much esteem by the members of the Council and those engaged under him. He leaves a widow and two sons, one of whom, Mr. Charles Wood, is Assistant Gas Engineer to the Corporation. At the monthly meeting of the City Council on Tuesday, the Mayor (Mr. T. Speight), who, as Chairman of the Gas Committee, had been brought into intimate relationship with Mr. Wood, moved the adoption of a resolution, placing on record the loss the Council had sustained by his death, and expressing their sympathy with his family. His Worship truly summed up the character of the deceased gentleman when he said: "Mr. Wood had been an old, a good, and a faithful servant of the Corporation. He had never made a great noise about his work, but had been a quiet, steady, honest, hardworking man, who had always done what he believed to be the best for the Council and for the ratepayers." These words were endorsed by Mr. H. B. Ratcliffe, who also referred to Mr. Wood's sympathetic nature, and the readiness with which he relieved those whom he knew to be suffering from want. The motion was carried in silence; the whole of the members rising. The funeral took place last Friday at Scholemoor Cemetery, and was attended by a large number of persons with whom deceased had been associated in his professional duties, and by many personal friends.

The death is announced of Mr. Hugh Brown, of Yeadon. He was one of the promoters, and for many years Director, of the Yeadon and Guiseley Gas Company, as well as a Director of the Yeadon Water Company.

By the death of Mr. Frank Ness, which took place somewhat suddenly last Friday evening, at the age of 76, the Directors of the Scarborough Gas Company have lost one of their colleagues and the "Queen of Watering-Places" one of her best known citizens.

Mr. J. R. Cobb, the Chairman of the Pembroke Docks and Town Gas Company, died on Monday, the 6th inst., at the age of 76. The deceased gentleman was well known throughout the Principality as a leading antiquarian; and his exertions for the preservation of the old churches and castles of Wales were widely recognized.

The death of Sir Frank Lockwood, Q.C., M.P., at the age of fifty-one, which took place last Sunday afternoon from failure of the heart after an attack of influenza, calls for notice in these columns from the fact that his name appeared prominently therein in connection with the important libel action of *Fox v. Jerome* which occupied so much attention a few months ago. Those of our readers who were present in Court during the progress of that celebrated trial will recollect the masterly way in which the defendant's case was conducted by the eminent lawyer whose career has been unhappily so prematurely brought to a close. It is not for us to dwell upon the forensic ability displayed by Sir Frank during those protracted proceedings; but it may not be out of place to reproduce, from the report of an interview with Sir George Lewis which appeared in yesterday's "Daily News," the following appreciative remarks made by him in reference thereto: "One of his latest and, in my opinion, one of his greatest successes was his defence of Mr. Jerome in an action for libel brought by Mr. Fox, of water-gas fame, against Mr. Jerome as proprietor and editor of 'To-Day.' Lockwood cross-examined Mr. Fox for two or three days with signal success. The manner in which he gripped the whole of the facts of the case, which was of the most complicated description possible, and laid them before the jury, was a surprise even to those who best knew his great abilities; and he brought it to an end—what was practically a victory—by the verdict passing against his client for one farthing damages."

PERSONAL.

Mr. A. T. Fletcher, formerly of Leigh (Lancs.) has been appointed Manager of the Ambleside Gas and Water Works, which have been acquired by the Local Authority.

At the meeting of the Gas Committee of the Leeds Corporation last Thursday, it was decided to appoint Mr. W. E. Pettigrew, the present gas tester, Manager of the York Street works.

Mr. H. D. Duesbury, of Carnarvon, has been appointed Manager and Secretary of the Hoddesdon Gas Company, in succession to Mr. F. Smallbone, who is now Manager of the Chigwell Gas Company.

Mr. John Aird, M.P., presided last Friday on the occasion of announcing the certificates awarded by the Examiners to the scholars at the Crystal Palace Company's School of Practical Engineering, the several departments of which were inspected by the visitors.

Mr. Frank Hyland has been appointed Liquidator, under resolutions, to wind up voluntarily the Ashford Gas Company, whose undertaking has been acquired by the Ashford District Council. The net proceeds amount to about £37,000. The issued capital of the Company was £20,700, which has just been returned to the shareholders on account.

The vacancy occasioned by the death of Mr. M. Murdoch, the Gas Engineer of the Rotherham Corporation, has been filled by the appointment of Mr. F. A. Winstanley, son of Mr. W. Winstanley, the Engineer of the Newcastle-under-Lyme Corporation Gas-Works. Mr. Winstanley has for some time assisted his father; and during the last few weeks, he has had temporary charge of the Rotherham works. There were thirty candidates for the position.

When noticing last week the admission of Mr. J. T. Rodda to the Institution of Civil Engineers, reference was made to his connection with the Eastbourne Water Company. On the reconstruction of the staff after the death of the Resident Engineer (Mr. George A. Wallis), Mr. Rodda was appointed Outdoor Superintendent, and consequently he has charge of the distribution department and all outside work. Mr. Rodda has been awarded several prizes for papers dealing with questions bearing upon water supply; and he has on various occasions given our readers the benefit of his long experience in his special department of engineering.

NOTES.

The Forecasting of Storms.

It is recognized as a blot upon our meteorological science and system of forecasting the weather, that no sufficient warning was given of the storms and high tides that have recently visited the south and east coasts of England with such disastrous results. To the question whether means exist for the better forecasting of exceptional gales, Mr. J. F. Nowack wrote to "The Times" of the 13th inst. in the affirmative. He claims that with a small observatory fitted with specimens of the "weather plant"—*abrus precatorius*—the tidal wave and the fearful storms that wrought such havoc in the lower reaches of the Thames and on the east coast would have been predicted many days in advance. He declares that he was able to forecast to a day, from a distance of thousands of miles, the cyclones that visited Halifax, Ohio, and other American towns, a short time since, when so many engineering structures were destroyed. This appears to have been effected not exclusively by means of the "weather plant," but by calling in the careful study of other phenomena, "especially sunspots, with their influence on electric and earth magnetic currents." If this claim is well founded, the sooner the new meteorology is put into general operation the better. There is an idea abroad,

however, that the "weather plant" has been tried under crucial conditions, and been found wanting.

Fireproof Construction.

The recent great fire in London lends additional interest to the results of the tests of fireproofing materials conducted in Hamburg, and discussed in the "Builder" for the 11th inst. The latest of these relates to the construction of fire-resisting warehouses, which is a class of buildings of great importance in Hamburg. According to the reports of the Technical Commission appointed to supervise these tests, attention was first directed to light wrought-iron uprights, which were tested in many ways and under widely varying conditions. Next came timber uprights, and lastly cast-iron columns and stanchions. It was found that wrought-iron uprights, if unprotected, show little resistance to fire; collapsing at a temperature of 600° Celsius. The filling-in of wrought-iron uprights with concrete only slightly increases their resistance. The protection of wrought-iron uprights with non-conducting materials very materially increases the resistance. Wooden uprights, if unprotected, catch fire at temperatures under 600° Celsius; but even when well alight they show a greater resistance than unprotected wrought-iron uprights. Neither wrought-iron nor wooden uprights give any warning of an impending collapse. Unprotected cast-iron columns, when loaded to 500 kilogrammes per square centimetre, collapse at temperatures varying from 750° to 850° Celsius. The resistance depends very greatly on load and section; and is very materially increased by protection. The question of what is the best means of protection does not appear to be settled by these Hamburg tests; but it is known that American tests favour a soft, porous kind of terra-cotta built up round the ironwork without actually touching it.

The Truth about Accumulator Traction.

Some information as to the working capacity of electric accumulators as applied to the driving of vehicles on common roads transpired at a recent meeting of the Institution of Electrical Engineers, when a paper by Mr. Epstein on "Accumulator Traction" was discussed. The appearance, in the streets of London and elsewhere, of motor cabs and light vans in which storage cells supply the motive power, has had the effect of creating an impression in the popular mind that something fresh has happened to improve the prospects of accumulator traction in competition with the trolley car, the gas or oil engine tramcar, and other systems of mechanical road car propulsion. There was nothing at all in Mr. Epstein's paper to confirm this popular notion; and in the course of discussion it was made to appear clearly enough that the system of accumulator traction still stands pretty much where it has stood ever since secondary electric batteries were invented, with the differences in details of design and manufacture that experience of the trade would naturally produce. Professor Ayrton declared that all experiments with accumulator traction were commercial failures; and he had no great confidence that any other result is yet possible. The makers of the cells continue to claim for them an efficiency which, to say the least, they do not yield in other hands. The weight of cells necessary for an accumulator-driven vehicle depends on the two factors of the capacity of the cell and the amount of tractive resistance of the vehicle. Professor Ayrton has never been able to get more than 6 to 8 watt-hours per pound; and the tractive resistance on good macadam is from 40 to 60 lbs. per ton. To drive one of the new electric cabs takes 3-horse power on wood and 5-horse power on macadam. This is a splendid testimonial for the common cab horse.

The Reduction of the Cost of Steam Power since 1870.

Mr. F. W. Dean has contributed to the American Society of Mechanical Engineers a paper on the subject of the reduction of the cost of steam power during the period from 1870 to 1897. He stated that at the earlier date the most economical steam-engine in use in mills was the Corliss simple condensing engine, which used 19 or 20 lbs. of steam per horse power per hour. Previous to that time, compound engines had been used in England in mill practice, and simple engines in many cases changed to compound. In the United States, the Worthington direct-acting duplex compound engine had been introduced at the Charlestown (Mass.) Water-Works; and the Morris engine at Lowell and the Leavitt engine at Lynn are well-known examples. The Lowell engine was of the type introduced by Messrs. Simpsons, who originated the arrangement of two compound cylinders with different lengths of stroke under one end of a beam. Pumping-engines have hitherto been the leaders in economy; but at present pumping and mill engine practice is practically of equal economy. In 1873, the most economical compound engines used about 16½ lbs. of steam per indicated horse power per hour. From this stage a number of economies have been rendered possible, until now the same class of engine would consume only 13 lbs. of steam per indicated horse power per hour. The causes that have conduced to this result are steam jacketing, the introduction of a cut-off on the low-pressure cylinder, and of a re-heater between the cylinders. Generally stated, the 13 lb. standard has been reached by an increase of steam pressure with resulting increase in the number of expansions. Better workmanship of boilers and engines has also contributed to the result. Mr. Dean asks the pertinent question as to whether there are any countervailing disadvantages to be set against this tale of progress in steam engineering. He finds none.

TECHNICAL RECORD.

DETERMINATION OF THE AMMONIA IN GAS LIQUOR.

The following is an abstract translation of a paper on this subject by Herren Ed. Donath and K. Pollak, which recently appeared in the "Zeitschrift für angewandte Chemie."

Two methods for the determination of the total ammonia in gas liquor have been suggested and brought into use. The first is the distillation method, by which the ammonia set free by caustic lime is distilled off, and received in standardized acid (*i.e.*, Wills's test, *cf.* Newbigging's "Handbook for Gas Engineers and Managers," p. 373). The second method is the azotometric or nitrometric process with sodium hypobromite. Undoubtedly, it is the more rapid—thanks to the numerous forms of gas-volumetric apparatus, and tables for the reduction of gaseous volumes—and therefore should be favoured by analysts. But Professor Lunge, in his work on "Coal Tar and Ammonia" (*cf.* second [latest] English edition, p. 573) only gives the distillation method for the estimation of the total ammonia in gas liquor. Later, when treating of the estimation of ammonia in its salts, he describes the nitrometric method (*cf. Ibid*, p. 706); and, therefore, the conclusion might be drawn that this method is unsuitable for estimating the total ammonia in gas liquor. Fehrmann in his treatise (German) on ammoniacal liquor recommends, for the general quantitative estimation of ammonia, the nitrometric method with Knop's azotometer; but when specifically dealing with the estimation in gas liquor, he describes a simple titration method, without distillation. He admits, however, that it is not exact. Post, in his handbook (German) on technical analyses, gives both the distillation and the nitrometric methods as equally suitable for the estimation of ammonia in gas liquor.

The authors of the paper have been in the habit of using both methods (one as a check on the other), in the numerous estimations which they have had occasion to undertake at the Technical College at Brünn. The results did not differ by much. The nitrometric method gave, without exception, a rather higher percentage of ammonia than did the distillation method; although, in the execution of the latter, Lunge's advice to distil for 2½ to 3 hours, was always adhered to. The following are examples of the results obtained; each figure being the mean from two concordant tests:—

	Percentage of Ammonia in Concentrated Gas Liquor.			Gas Liquor.	
	(1)	(2)	(3)	(4)	(5)
Distillation test . .	16·70	15·47	19·91	2·07	1·62
Nitrometric test . .	16·92	15·70	20·27	2·10	1·67

The differences between the results of the two methods are trifling when ordinary gas liquor is tested; but they become very considerable with the so-called "concentrated" liquor, and cannot be ignored by manufacturers of ammoniacal preparations or by the managers of ammonia-soda works. It seemed possible that the higher results of the nitrometric method might be due to nitrogen or some other gas being liberated from other nitrogenous substances than the ammonia present in the liquor. If gas were so liberated, its volume would be added to that of the nitrogen liberated from the ammonia, and would therefore increase the computed quantity of ammonia.

Attention was first directed to the sulphocyanides; because they are always found in gas liquor, and because the behaviour of analogous organic compounds towards the hypobromite solution favoured the view that they might be affected by it. The action of the hypobromite solution on a solution of ammonium sulphocyanide was, therefore, observed. This salt contains 18·5 per cent. of ammoniacal nitrogen, or 22·4 per cent. of ammonia. In two tests, 21·24 and 21·55 per cent. of nitrogen were found—corresponding to 25·8 and 26·18 per cent. of ammonia. Other tests were made with solutions of potassium sulphocyanide and ammonium chloride. Thus 2 c.c. of a weak sulphocyanide solution gave 1·1 c.c. of gas; 5 c.c. of ammonium chloride solution gave 5 c.c. of gas; while 2 c.c. of the one and 5 c.c. of the other solution, when mixed, gave 6·2 c.c. of gas. A stronger sulphocyanide solution gave, for 5 c.c., 9·8 c.c. of gas; 5 c.c. of ammonium chloride solution gave 48·2 c.c. of gas; while 2·5 c.c. of each solution, mixed, gave 29·1 c.c. of gas. Clearly, therefore, the quantities of gas developed by solutions containing both ammonia and sulphocyanide compounds are equal to the sum of the quantities which correspond to each of these compounds. But 10 c.c. gas liquor gave 11·1 c.c. of gas; and 2 c.c. of a solution of potassium sulphocyanide gave 7 c.c. of gas. On the other hand, 8 c.c. of the liquor mixed with 2 c.c. of the sulphocyanide solution, twice gave only 12·9 c.c. of gas. The fact—at present inexplicable—is, therefore, that the quantity of gas from the gas liquor is not equal to the sum of the quantity of nitrogen from the ammonia compounds, and the gas developed by the sulphocyanide. But the quantity of gas found is undoubtedly always greater than that of the nitrogen from the ammonia compounds by themselves.

A quantity of the gas obtained by the action of the hypobromite solution on potassium sulphocyanide was prepared and examined qualitatively. It appeared to contain, in addition to atmospheric air, chiefly nitrogen and carbonic oxide. The

action seems to be deep-seated, as the sulphur of the sulphocyanide is converted to sulphuric acid.

The authors are continuing their investigations on the action of the hypobromite solution on sulphocyanides, cyanides, ferrocyanides, and gas liquor; and they wish to reserve their claim to this subject of research, pending the publication of a further paper on it by them. The conclusion may be drawn, however, that the volume of gas developed in the nitrometric estimation of the total ammonia in gas liquor, and reckoned as ammoniacal nitrogen, is increased by the gaseous products of the action of the hypobromite solution on the sulphocyanide compounds in the liquor. Therefore the nitrometric methods recommended for the estimation of the total ammonia in gas liquor are inexact, and give higher results than the distillation method. Professor Lunge consequently is quite justified in recommending only the latter method of valuing gas liquor in his work on "Coal Tar and Ammonia."

ENRICHMENT OF GAS BY ACETYLENE.

At the last Meeting of the Société Technique du Gaz en France, a communication was presented by M. Th. Vautier in which he gave the results of some investigations he had carried out to ascertain the value of acetylene as an enricher of gas produced from lean coals. The text of the paper, which is accompanied by several large tables, was given a short time ago in our French contemporaries; and it is also to be found in the recently issued volume of the Society's "Transactions." The following is an abstract translation of the document.

In carrying out his tests, M. Vautier took gas produced from coals yielding gas of poorer quality than the Paris standard. He determined first of all the proportion of acetylene required to bring it up to, and even beyond, the standard; and, secondly, the light obtained when the enriched gas was consumed by means of burners of the usual types, with the corresponding consumption. The coals selected were from the mines of Bessèges and Lens; and they were carbonized in works in the vicinity having two sets of manufacturing plant which could easily be isolated. The gas was conveyed to a holder of about 10,600 cubic feet capacity, where it was allowed to remain until required. When brought into use for the experiments, it was first passed through a test-meter, and then to an enriching apparatus, where it mingled with the acetylene; the mixture being subsequently led to a small holder, whence it was drawn for the supply of the various burners employed. The acetylene was produced in a Lequeux apparatus, and conveyed to a holder of about 21 cubic feet capacity, from which it passed through a test-meter and eventually to the mixer. The pressure in the holder containing the crude gas was 2·4 to 2·8 inches; that in the acetylene holder, 2·8 to 3·2 inches. The outlet orifice of the tube leading from the latter holder was enlarged as the quantity of acetylene employed varied from 2 to 8 per cent. The proportions of the two gases in the mixture were carefully measured. The Bessèges coal was of special quality, costing 14 frs. 50 c. (11s. 8d.) per ton, and yielding 8930 cubic feet of 116-litre gas per ton; the Lens coal was of the ordinary commercial kind, costing 9 frs. 50 c. (7s. 8d.) per ton, and yielding in round figures 9180 cubic feet of 130-litre gas per ton. That is to say, 4·1 cubic feet of the first-named gas, and 4·60 cubic feet of the second, produced the light of a carcel (9·6 candles). It was found that the light varied, but not to a very large extent. So the above figures were taken as bases, and curves were made in which the ordinates were the consumption of gas per carcel-hour, and the abscissæ the percentage of acetylene used. They showed that the illuminating power increased most rapidly in the case of mixtures containing up to 5 per cent. of acetylene, and that there was a still greater gain when the combined gases were consumed with flat-flame burners. With Welsbach burners, on the other hand, the improvement was, as might be expected, scarcely appreciable.

The elaborate tables accompanying the paper furnish some remarkable results, upon which M. Vautier makes a few interesting observations. First of all he endeavoured to ascertain whether the light-giving quality of the gas alone determined the consumption per hour in a given burner; and he found that when the two gases were brought up to between 95 and 105 litre quality, the output of each was the same in an argand, and practically the same in a square-top flat-flame burner, for a like quality. With the other burners, however (the hollow-top and the "Manchester"), there was a difference of about one-tenth; showing that for these burners the effect of enrichment had a great preponderance over the other elements by which the Lens gas differed from that produced from the Bessèges coal. Proportionately more Lens gas was required for the production of the carcel even when the two gases were enriched to the same degree. Next, the author concluded from his results that the consumption per carcel-hour of the same gas successively enriched was not proportionate to its light-giving standard (between 3·3 and 3·7 cubic feet per carcel), except for argand burners. With flat-flame burners the ratios increase as the quality decreases; showing in a marked degree the inferiority of these burners as compared with the others.

Coming to the question of the exact economy realized by burning enriched instead of poor gas, the author gives a table, showing the effect of the addition of 1 per cent. of acetylene to three qualities of gas. The figures were arrived at by the aid of a formula which assumed the economy effected to be proportionate to the volume of acetylene added. If this condition had been exactly realized, the numbers on the same horizontal line would have been equal. The difference between them shows the degree of approximation of this hypothesis:—

Burner.	Coal.	Quality of Gas.		
		55-litre.	100 litre.	105-litre.
Argand	Lens	5·7	5·8	6·0
	Bessèges	5·6	5·4	6·5
Flat-flame (square top)	Lens	11·9	11·9	12·0
	Bessèges	11·7	11·6	10·6
Flat-flame (round hollow top)	Lens	10·5	10·0	9·6
	Bessèges	12·0	12·2	12·2
Manchester	Lens	14·7	14·3	13·1
	Bessèges	14·1	13·0	13·4

With regard to the expense of bringing up to the Paris standard the gas produced from the two kinds of raw material experimented with, the author puts it at 4·12 c. and 2·58 c. per cubic metre for Lens and Bessèges coal respectively, or about 11d. and 7d. per 1000 cubic feet. The author's investigations showed that the Lens gas would require for its enrichment 3·092 per cent. of acetylene, for which 22½ lbs. of calcium carbide, costing 3s. 4d., would be necessary; while the Bessèges gas would require 1·936 per cent., the carbide to produce which would cost 2s. 1d. The author acknowledges that these figures might be even higher. At the same time, he points out that they are lower than those met with in practice with the materials usually employed for carburetting gas. The results of his labours point to the conclusion that acetylene cannot be utilized as an enricher in gas-works until the price of carbide of calcium has been considerably reduced. He endeavoured, however, to ascertain if there were not some special conditions under which it could be employed with advantage, as, for example, in gas-works near the Bessèges coal mines, where the use of the local coal had been discontinued in favour of English, even at increased cost, on account of its superior gas-producing quality. He found that to obtain 100 cubic metres of gas of the Paris standard would require 98·1 per cent. of poor gas and 1·9 per cent. of acetylene, the raw material for the production of which would cost 9 frs. 18 c. (7s. 4d.); whereas sufficient English coal to produce the same quantity of gas of the standard illuminating power would come to 8 frs. 58 c. (6s. 10d.). Consequently, even where coal of good quality is burdened with heavy freightage—leaving out of consideration the labour and apparatus necessary for dealing with the calcium carbide, and taking no account of the inferiority of the coke from Bessèges coal—the use of acetylene for carburetting gas is expensive. The scale might, however, be turned in its favour in countries where the Customs duties increase the price of good foreign coal.

THE ILLUMINATION OF ENCLOSED SPACE.

By Dr. W. H. Birchmore.

[Prepared for the "American Gaslight Journal."]

The problem presented to the individual man intending to provide light for any enclosed portion of space—by which, for the purpose of this discussion, is understood a hollow figure bounded by surfaces—is more or less exactly a copy of the problem presented to anyone intending to illuminate any other space of the same or similar sort, and, as such, is to some degree capable of a mathematical discussion. Strictly speaking, however, the mathematical discussion has, up to the present, been principally concerned with a space either quite unlimited, or of such large dimensions—large, that is, in proportion to the light units employed in the illumination—that the laws governing light-projection have seemed to apply. Within this limit experience has provided data which, properly discussed by many competent hands and pens, have reduced this part of the problem to a by-corner in mathematical physics.

Outside of the domains thus pre-empted by the experts in physics is a wide range of debatable ground, over which mathematical formulæ and fetters have not yet been set up as landmarks. Concerning this domain we have much information derived from experiments, and experience of a sort not properly to be called by this name; and a multitude of minute details are matters of record. Some attempts at mathematical generalizations have been made; but the results have not justified the labour expended. Beyond this debatable ground stretches out a far vaster region quite unexplored, which is occasionally invaded by an adventurer, so to say, who sometimes brings away rich booty, but who more often leaves his stores a prey to the savage difficulty of the way.

In every problem in illumination, no matter how explicit, or how vast and indeterminate, a point and a plane are always found given. This point is the centre of the luminous radiation;

the plane is that of projection. In illuminating all out-of-doors, as with a street-lamp, the given plane is the street-level, and the luminous point the vertical centre of the (say) Welsbach mantle heated to incandescence by a flame. Persons walking or riding by such a lamp intersect the lines of radiation, as opaque bodies must, and cast shadows on to the projection plane. These shadows are intensely dark, by contrast, and are often the cause of loud complaints, sometimes only too well justified. In general, however, streets are held to be well lighted; and the outdoor illumination problem may be considered as solved.

In enclosed space—for example, a large room—using the words in the most restricted sense, so satisfactory a conclusion would not hold good; in the practical illumination of a room 50 feet long, 20 feet wide, and 12 ft. 6 in. high, for instance. This room would have 1000 square feet of floor space; and in this respect it answers nearly enough to the floor space of the parlours in an average house in New York. The total area of the boundary planes, omitting the accounting of doors and windows, is as follows: Floor, 50 feet by 20 feet = 1000 square feet; ceiling, 50 feet by 20 feet = 1000 square feet; two ends, each 12½ feet by 20 feet = 500 square feet; two sides, each 50 feet by 12½ feet = 1250 square feet. Total area of limiting surfaces, 3750 square feet; total cubic contents, 50 feet by 20 feet by 12½ feet = 12,500 cubic feet. Within this space are objects which must be rendered visible and distinct; and the principal purpose of the use of artificial light is really to make such discrimination easy. These objects differ in their shape, density, opacity, and colour. Some have large indices of reflection; others hardly reflect light at all. In studying the problem of illuminating this space, all these things, and their influence on the final solution, must be considered. The first question, however, naturally concerns the centres of radiation—the various points which are the *loci* of the forces producing the disturbance that we call light.

"Shall the lamps be in the centre or on the sides to secure the best results?" This question, if it may be so called, is one which must come to everyone who has to determine the data for illuminating a room; and in the majority of cases it will be determined as to its answer by a whim of Dame la Mode. Justly treated, it is a question of the highest scientific importance; and its satisfactory solution may well employ the minds of men of the most superior attainments.

Historically, the location of lights in rooms is a most interesting study, and is one which would justify much antiquarian research. But in this present our study must begin in very recent times—no longer ago than the beginning of this century. For ages two systems of illumination had been in vogue, and at that time were in use. If the room was to be brightly lighted, candles (rarely lamps) were used; and these were placed on the sides of the apartment. If the room was very large, in addition to these lamps were used, placed in large frames, and hung in chains from the roof; swinging low so as to get the maximum of service, but sufficiently high to clear the heads of the people assembled in the room. In churches, single swinging lamps, and in groups of seven and nine, arranged in various patterns, were quite common. In public halls, notably in Holland, the number of lamps in a group like an inverted pyramid was frequently enormous; and one is mentioned as peculiar in that it contained 365 lamps, one for each day in the year. There should be no confusion between these "chandeliers" and those we have knowledge of for gas lights. They have nothing in common, except that both are pendant systems. The construction was entirely different. Sometimes the swinging frame was filled with candles instead of lamps; but as the heat in the upper tiers was enormous, the candles softened, and such lights were difficult to maintain and were seldom used. The danger that the lamps in these large groups would be overheated, especially in the uppermost tiers, was well understood; and this method of illumination was by no means approved of, though very generally used. In Paris it was placed under ban, after the accident which history records as having so notably disturbed Napoleon's equanimity.

Fashion, prejudice, and prudence alike favoured the wall lights, until gas furnished a perfectly safe method of illuminating a room from the dome or ceiling. This method was at first introduced and adopted only in rooms of great height. The pendants bearing the gas-burners were needfully a few feet long, to give them room; and, in the comparatively low rooms of the early part of this century, such pendency would have caused serious inconvenience in the average habitation. How far the demand for pendant lights in the middle of a room has influenced the increase in height, no one can say. Undoubtedly, it has influenced the change to an extent—in the opinions of some experts, very materially. An evidence almost amounting to demonstration of the reason for the preference shown for the use of the pendant lamp rather than the bracket may still be seen in many "improved properties" in which the rooms are so low that some article of furniture is set beneath the lamp to prevent the injurious contact of some unaccustomed head.

Historically, the habit or fashion of lighting rooms from the centre seems to have the following reason for being: When gas was introduced into the large houses of the rich, it was used for display, and therefore was used first in the ball-rooms. These rooms were usually lofty, and the simplest way of disposing of the piping was to lay it in the floor of the overhead room, and then drop the pendant, as is the universal rule to-day. This was the method requiring the minimum of alteration and the minimum of skill. At this period no changes were made in the bed-rooms, nor in such rooms as the library or dining-room. The change was made first in the ball-room, then in the entrance-hall, and after this in the drawing-room. Lamps rather than gas were the fashion in libraries in large houses in London as late as 1856, and candles have never been displaced in thousands of elegant bed-chambers in the West-end, if one may judge from the written words.

There is more than sufficient evidence at hand to show that in New York, as in London, the ground rooms of large houses were illuminated by gas before the drawing-rooms. In a luxurious home, one would naturally infer that candles and candlesticks would be found on the dining-table and in the library and bed-rooms long after they had gone from everywhere else. Thus it came about that to have certain rooms illuminated by a pendant gas-lamp of many burners was an evidence of wealth, refinement, and social superiority. Every builder of brick abominations for the would-be somebodies found it to his advantage to say that "the drawing-room in this fine suburban residence is lighted by a pendant of six burners, exactly as is that of Lord X——'s country house near by." (From a renter's "ad.," 1823, or thereabout.) Necessity first, and then fashion, set the pace; and rooms are still, if it is a possible thing, lighted with lights hung from the ceiling rather than from brackets on the wall.

Returning to the parlour floor already imagined, from the dimensions given and the arrangement of lights usually employed in New York, it will be a fair assumption that two pendant lamps will be used—one of four burners, 12 ft. 6 in. from the rear wall, and one of five burners, 12 ft. 6 in. from the front wall. Since the room has been assumed to be 12 ft. 6 in. high, these lamps will probably be about 8 ft. 6 in. from the floor. The radius will be 18 inches in either case. Assuming the unit to be a Welsbach mantle, and the illumination to be 40-candle power for each mantle, or 160-candle power for the smaller pendant and 200-candle power for the larger one—equivalent to 360-candle power in all—the question which interests us first of all is a purely practical one: "Is this the best use that could be made of this enormous luminosity for the purpose of illumination?"

Diagram A illustrates the relations of the lights in a plane passed parallel to the end of the room through the two lights supposed to be in this plane. A, B, C, D are the points of intersection of the four planes bounding the room; E and F represent the two mantles already mentioned; H H_1 and I I_1 the bases of the triangles representing the shadows cast by the two fixtures in this plane. Regarding the two mantles as one system, the centre of luminosity is at x, the centre of the circle, which cuts all four mantles at their centres of luminosity.

When one reads by a paraffin or other "standard" candle, the book or paper read is considered by physiographers to be placed 10 English inches from the eye; and this is universally conceded to be the ordinary position for distinct vision of type the size of that used for newspaper print. At the same time, it should be remembered that the relation of the paper read to the light is not that of a normal plane, but makes an angle with this normal, consequent upon its distance from the unit light. This distance has, by careful investigation by many observers, been determined to be something very near 18 inches. This being premised as the basis on which this inquiry is to be conducted, the relation of the total incident value of the luminosity actually in use has been reached as follows: Since the angle formed by the actual normal with the bisecting line between the axis of sight and radiation is so very small as to have no material effect, it has been neglected, and the plane of incidence has been treated as a normal plane. From this it follows that when one possessed of ordinary sight reads this page, he will place it 18 inches from a standard candle. Under such circumstances, 1 square foot of this page will receive only 0·6 of the light which it would receive at a unit's distance.

The first circle drawn from x as a centre applies in this case only to the lights regarded as a system. This may be considered as the equator of a sphere containing all four lights, having a radius of 2 feet. Every square foot of this sphere is illuminated by as much light as would fall on it from 40 candles at 1 foot distance. The next circle has a radius of 7 feet. On this sphere the square foot accepts as all it can get, 1-49th of the 160-candle power; while at the next one a radius of 10 feet brings the equivalent down to 1·6 standard candles at a distance of a foot. Truly, one may complain that the sides of the room are too far from the light.

Another vexatious difficulty is "shadow." Since the entire luminosity in any sphere large enough to contain all four mantles is virtually at x, every line of light casts a shadow more or less intense with respect to this point. At the same time there exist *four*—no less—other sensible shadows, or five in all, cast more or less exactly in the same direction. The result is a complete disfigurement of the outlines of all complicated surfaces and figures not surfaces of a sphere having its centre in x; and as there is not one chance in a million that any such surface will exist, one may safely say that no solid of any sort whatever will show its true form anywhere, excepting in the space between the primary shadows of the burners—that is, in the space between H_1 and I.

This is a fine state of things, truly; and it is useless for any one connected with gas interests to waste energy in increasing

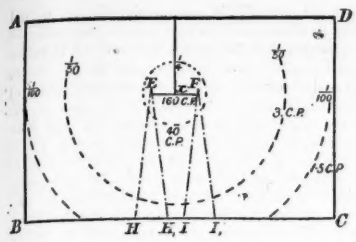


DIAGRAM A.

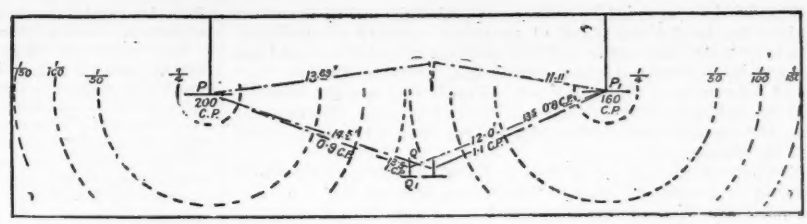


DIAGRAM B.

the supply of light until some much better arrangement of the centres of luminosity is attempted. The architects who have studied this question anathematize the system, but state that they are powerless against the gas interests—pretending to say that we are the fountain-head from which improvement must come. While I positively decline to believe we are sinners beyond all the rest who dwell in Jerusalem, I certainly do think we owe it to our position to try and remedy this state of things. I am by no means ignorant of the beautiful forms given to these pendant lights, nor to the impression of sense produced when one looks upon the 160-candle power assembled round *x*; nor am I ignorant of the way in which this arrangement spoils effects of dress and ornament by garishness and shadow. The larger pendant only gives increased prominence to the ills mentioned; but between the two pendants, in the middle of the room, is a region illuminated most beautifully—almost ideally, in fact.

Curiously enough, in most city houses this area is made to correspond with a hole in a partition. Very careful study has only given me the details of a fact and condition surprised by chance. In a few words, this is what I found: Setting up my measuring apparatus in the doorway usually occupied by the folding doors, I found conditions of illumination and shadow which were strictly comparable with outside (daylight) illumination. First of all, there were no dense shadows. The greater volume of light from the pendant in the front room cast a shadow on to the field of the lesser pendant; but it was not a dense one, and the secondary shadows had all vanished. The wall which parted the two parlours acted as a screen over a large part of the field that was illuminated by the two pendants; thus making worse than ever the exaggerated shadows. But in the doorway the illumination was perfect. Form images which could not be distinguished on either side of the doorway, no matter in which room they might be placed, showed distinct and true within the charmed space.

There is nothing plainer and more distinct possible than the reason. Objects are made distinct by the contrast of the two-light systems. Obviously, if this theory of the defect were true, there must be an area in which all the shadow effects, and consequent errors produced in the opposite order, may be shown at will. Imagine a sheet of tracing paper 1 foot square, to be held so that a normal to its surfaces lies in the plane joining the virtual radiation points of the two pendant systems. Then, since the law of the squares of the distances holds on both sides, the illumination would be exactly equal when the sheet is 13·89 feet from the larger and 11·11 feet from the smaller pendant. We may also imagine a plane perpendicular to the floor to be passed through the two luminosity centres, which will also be normal to the sheet of paper just mentioned. If a third plane be imagined, and an enlargement of the paper sheet prolonged to the floor considered, we shall find that the equality of illumination of the two sides no longer exists, but that there is a small space over which the behaviour of the lights is truly mysterious.

Diagram B shows the circles of equal intensity, not of equal radius. It will be seen that, while circles of equal intensity in the horizontal plane are tangent, as above stated, there is absolutely no other point where such equality can be established. This brings us logically to the difference in the shadows. It would be an unwarrantably intricate subject to discuss these shadows in detail, with respect to any great number of planes; but I believe it possible to show their bearing with reference to two planes—those of the axis of the room and of the wall—without dragging in any mathematical difficulties.

Let us suppose the horizontal lines in diagram B to represent a table covered with a white cloth, and QQ_1 to be a plane of blackened copper set up on edge normal to the table and to the plane of the two pendant illuminating centres PP_1. Supposing the table to be placed exactly midway between the lights, as shown, the angles $Q\,P\,Q_1$ and $Q\,P_1\,Q_1$ will be equal, and the amount of light falling on the two sides will vary as the intensity of the radiation—*i. e.*, the light on the side towards P will be to that on P_1 as 5 : 4. But, if we consider, we must see that one shadow will be more intense than the other, and the lesser shadow will be invisible. If for the plane we substitute a ball, we have sufficient shadow to show the form, and we also have enough illumination on the shadow side to make a perfect image. Shade off either light, and the shadow density is increased, the contrast is exaggerated, and the image is rendered imperfect. Our mental processes supply the wanting parts of the image in some instances; but a photographic camera, in that it has no mind, gives a false impression always. This illumination from one side only, or, as Professor Airy once called it, "jug-handle illumination," exists perfectly in half of the room, and more or less in three-fourths.

Now, suppose the plane, table, and ball to be placed as near as possible to the wall. The illumination around the entire room is defective as to form-images, because of false shadows, or absence of shadow, except between the planes passing through the pendants and parallel to the ends of the room. But the inequality of the illumination between these planes brings the whole form-image into relief, and we have a perfect image of the ball, if we can bring the ball into a plane passed horizontally through the pendants; but the image begins to err just as soon as the law of the sines of the perpendicular angles comes into play. It is obvious that there is no use in pointing out defects in any system except to offer a criticism; and there is less use in a criticism which offers no hope of betterment. Therefore, all the time I have spent in studying this question of radiation and shadows is time wasted unless I am prepared to offer a cure. I have not wasted time in fault finding, for I am prepared to make a suggestion looking towards such cure.

If one studies carefully the time of day, the altitude of the sun, and the condition of the clouds and atmosphere, when objects are most correctly seen at a reasonable distance from the eyes—say 1000 feet away—it is demonstrable that vision is clearest and generally most efficient and satisfactory under the following conditions: If the sun is directly behind the spectator, the vision is best the nearer the sun's altitude is to 15°. In any other position whatever it improves until the sun's altitude reaches 30°; and then it falls off rapidly as the altitude exceeds this, unless one happens to be looking directly towards the sun, when the higher the altitude the better the vision. The mathematical expression, though very exact, is unsuited for reproduction here. Generally, however, an object between east and south-east is seen best in the late afternoon; between south-east and south-west, between nine in the forenoon and three in the afternoon; between south-west and west, before nine in the forenoon; between west, north, and east, during the two hours on either side of noon, and decidedly better in winter than in summer, or, more accurately, between the middle of September and the middle of March, than between the middle of March and the middle of September. The condition of the sky which aids most in vision is that of a number of bright white clouds so placed that any line joining them and the sun crosses the line of sight as near as may be at right angles. In general, the less the dust the clearer the vision.

Reducing these well-known data to their connection with previous matters discussed, we may institute the following comparisons: The angle made by the beam of light should not be greater than 30° for the major part of the light. In the room we have been considering, this fact forces itself into prominence in a very curious way indeed. If a lady, clad in what is called a "princess" dress, stands near to one of the pendants above described, her coiffure and the ornaments of her dress about the neck, the blemishes of skin, and the detail of the lace, will distress one by their intensity; the ornamentation extending towards the hem of the garment becomes less and less distinct, while the detail of the ornament at the hem will be quite invisible—in a word, there is no *ensemble*. But let the distance be increased so that the angle of 30° or less is made with the lines of radiation by the observer's line of sight, and the distressing garishness is gone, and from head to foot the ornamentation appears—the *ensemble* is complete. This is exactly parallel to the fact just mentioned in regard to the sun. When the lady stood very near the light, the angle between the line of radiation and the line of vision was nearly or quite 90°, and the distance between the centre of radiation and her head was so small compared with the distance between the centre of radiation and the floor that the light fell off rapidly.

The second important fact—that of the white clouds—has already been illustrated by the question of the shadows; but referred to matters of costume, it may be thus illustrated. Every photographer is taught by bitter experience that, while there must be a certain difference between high light and shadow, this difference must not be too great. I have tried to show how anyone may study its effects for himself in the parlours of an ordinary house; and I have stated the relations of the "white cloud" to distant, distinct vision. This is the second important point which must be enforced in a properly illuminated room. Both sides of every object in it must be illuminated—persons as well as things.

The third great point in reference to daylight out of doors on a clear day is the condition of practical equality of the light. We may sometimes get out of the sunlight, in order to avoid too intense brilliance and garishness; but we never get into it or avoid the shadow. Why is this? Simply because the smooth and even intensity of daylight is almost the same everywhere. The more nearly we can obtain this in our rooms, the better they will be illuminated.

Now, what are the *desiderata?* First, in place of an angle varying between 90° and 15° in a few vertical feet for that between the line of radiation and sight, an angle varying between 60° and 30° is wanted; secondly, in place of a difference between illumination and shadow of a possible 160-candle power on one side and a very small fraction of 1 candle on the other, an illumination difference of relatively small amount, a few per cent. being quite enough; thirdly, an even diffusion of illumination over the entire space of the room. Not 200-candle power equivalent in one spot and ½-candle power in another, but about 25-candle power equivalent everywhere in the room.

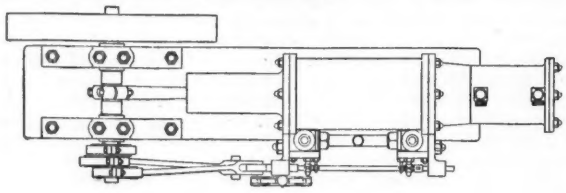
There is no need to say this is a thing everyone knows and nobody strives for; this is not true. We who are familiar with such things may know it; but the men who pipe houses, build them, design and live in them, do not know it. If we really set about teaching them, we could very soon effect a change of method which would be for our advantage in two ways—first, we should hear less about unsatisfactory illumination; and, secondly, we should increase the consumption of gas and the revenue of the companies we serve in equal measure. Nor would the consumer complain of an increased expense.

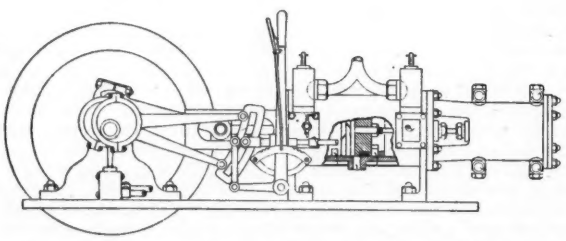
This study was undertaken for an architect, in order that a plan might be devised for correcting the faulty illumination of a house. The faulty illumination was corrected, and the client was delighted. I propose in my next chapter to tell how we did it, and to state the result of the experimental test of our success.

REGISTER OF PATENTS.

Gas-Engines.—Read, S., and Turner, M., of Brighton. No. 26,399; Nov. 21, 1896.

This is a gas or oil engine, in which compressed air is used in the vaporizing chamber or gas-reservoir, forming a mixture of gas and air under pressure; thereby enabling the engine to be driven by an explosion at each stroke of the piston. The engine is double acting; the cylinder having closed ends. On the side of the cylinder, at or near each end, is a combustion chamber fitted with inlet-valves to admit gas and air under pressure to the chambers and cylinder and sparking-gear. Immediately on operating the reversing lever shown, an explosion takes place, putting the engine in motion, followed by the port of the piston opening to the cylinder exhaust at or near the end of the stroke. Instantly following the exhaust, gas and air are admitted by pressure at every stroke through valves, and fired in turn by the sparking gear.





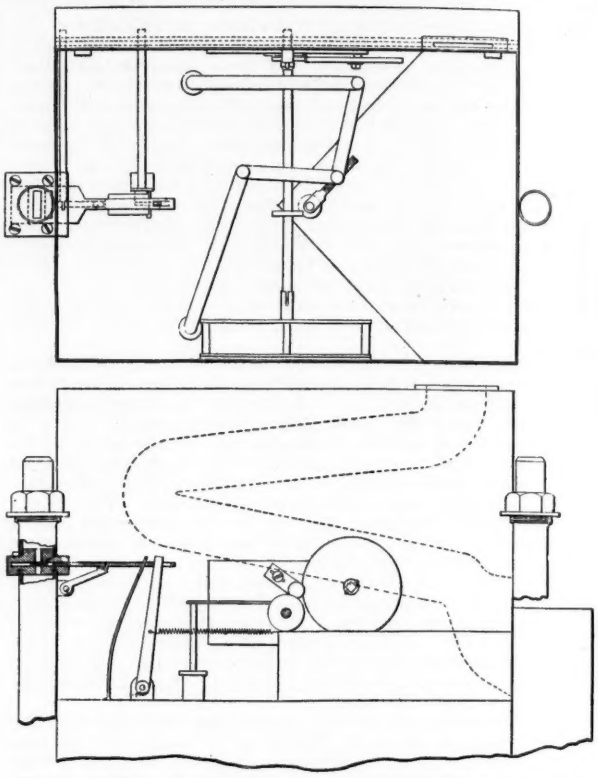
The engines are fitted with piston-rods, connecting-rods, eccentrics, and reversing-link motion, thereby enabling the operator to instantly reverse his engine, and by linking up the sparking-gear cause the explosion to take place early or late of the dead-centres. The seating of the inlet-valves is perforated to allow free passage for gas and air and prevent firing-back; and in addition portions of the main supply-pipes are fitted with fine gauze. The link motion operates a rod, to which are attached adjustable tappets for breaking the sparking contact.

The pressure of gas and air is maintained by a double-acting air-pump bolted to the end of the cylinder, and worked by a continuation of the piston-rod. The supply of gas and air to the engine is regulated by the pressure in the reservoir; and the pressure in the reservoir is regulated by adjusting a safety-valve on the air-pipe between the air-pump and the gas-reservoir.

Prepayment Gas-Meters.—Harrison, H. T., of Victoria Street, S.W. No. 27,210; Nov. 30, 1896.

This invention has reference to prepayment gas-meter apparatus so arranged as to stop delivering in the event of being so tampered with as to cause the gas-valve to remain open otherwise than by a properly inserted coin. The arrangement is such that, before the meter can then be again made to deliver gas by the insertion of a coin, adjustment must be effected of certain parts, to which access cannot be gained without the use of a special key in charge of the company's inspector.

The mechanism comprises a part which is caused to travel all the time that the meter is delivering, and a device that is connected to the valve, and which, so long as there is in the apparatus an appropriate coin, full value for which has not yet been delivered, is kept out of the path of the travelling part. When, however, the quantity of fluid paid for has been delivered, the coin is caused to release the device connected to the valve, a portion of which thereupon moves into the path of the travelling part; and if, owing to the apparatus having been tampered with, the meter now continues to deliver, the travelling part will come into contact with, and operate, the device connected to the valve, and move the latter into a position in which not only will delivery be arrested but, in order to restore the valve into a position in which it can again be operated by the insertion of a coin, the key referred to will have to be employed.



Meters embodying these features are constructed in such a manner that a coin introduced into the shoot will first cause the valve to be moved into the open or delivering position, and subsequently will cause the device connected to the valve to be moved out of, and will (until the quantity of fluid corresponding to the value of the coin has been delivered) keep the device clear of the path of the travelling part.

Apparatus to operate on this principle may be variously constructed—one arrangement being shown by the engraving. The travelling part that actuates the device connected to the valve when the meter is delivering fluid not paid for, is a projection on a wheel driven through the meter-mechanism actuated by the fluid. The device comprises a couple of levers, one of which is depressed by the coin, while the other is linked to it, and connected to the valve. This constitutes the medium through which the projection on the wheel actuates the valve; while there is on the same wheel a second projection which, as it travels round under ordinary circumstances, actuates releasing mechanism on the completion of the delivery of the quantity of fluid paid for, whereupon a spring causes the valve to assume a position in which delivery is arrested.

Igniting and Extinguishing Gas-Lamps by Electricity.—Chateau, J. D. C., of Paris. No. 27,449; Dec. 2, 1896.

This invention relates to "the igniting and extinguishing from a distance (by electric currents), and at different times, of the whole or a part of a series of gas-burners controlled by the same wire, or to effect generally the operation of the whole or part of a certain number of igniting and extinguishing devices arranged in series on the same wire."

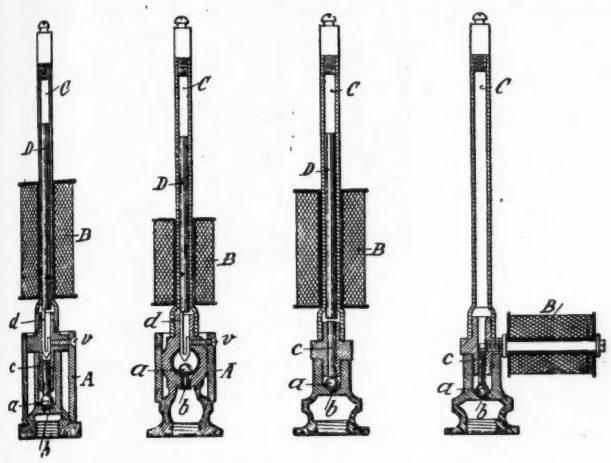
Apparatus for effecting this comprises: (1) Burners arranged in such a manner that the gas will be ignited by the passage of an electric current in one direction, and be extinguished by passing the current in the reverse direction. This kind of burner is referred to by the patentee as X type. (2) Burners so arranged that the gas will be ignited by a current irrespective of its direction, and will be extinguished by the mere operation of a switch—type Y. (3) Igniting devices, one for each burner, designed to effect the igniting operation proper under special conditions. (4) A switch constructed to distribute the current in a special manner to the burners. (5) Various minor details of construction.

Fig. 1 shows a burner of the X type; and fig. 2, another variety of this kind of burner. Figs. 3 and 4 show burners of the Y type.

The burners, type X, comprise (as illustrated in fig. 1) a valve *a*, such as a ball, cone, or the like, placed on a gas-outlet orifice *b*, in a casing adapted to be screwed upon a gas-supply pipe. A mass *c* of soft iron is situated above the valve, and in the form of a short cylinder. A magnet A, in the form of a tube, is fixed around the valve-casing by a screw *v* to an approximately V-shaped part *d*, situated in line with and above the valve *a* and the soft iron mass *c*. A solenoid B is arranged on the stem C of the burner, at the top of which is the burner proper; and a

rod D of steel (the solenoid core) is arranged within the stem. The power of the magnet A is made such that, under ordinary conditions, it is not able to support the mass *c* and the valve *a*. When, however, an electric current is passed through the solenoid B in the proper direction, the core D is magnetized, and acts to aid the magnet A in such a manner that, by means of the V-shaped part *d*, the mass *c* and the valve *a* are raised. But when, on the contrary, a current is passed through the solenoid B in the reverse direction, the solenoid core D acts in the reverse direction, and the point of the V-shaped part *d* becomes a consequent point of the entirety consisting of the magnets and the soft iron parts; and consequently the valve falls upon its seat, and cuts off the further supply of gas. The soft iron mass bears upon the valve, so as to effect its more complete closure.

Fig. 1. Fig. 2. Fig. 3. Fig. 4.



As a variety of this kind of burner, there may be used the arrangement shown in fig. 2, in which the soft iron mass *c* is dispensed with; the solenoid core D acting solely, through the part *d*, upon the valve *a*, whose seat is formed by a screw having a hole *b* made centrally through it.

Burners of the type Y comprise (as shown in fig. 3) a hardened steel rod or core D, arranged inside the burner-stem C; a solenoid B around the stem C; a valve *a*; and a soft iron mass *c*. The arrangement is such that, if a current be passed through the solenoid B in either direction, the steel rod or core D will be energized, and the soft iron mass *c* will be attracted and become itself energized, and will in its turn attract the valve *a*, which will allow the gas to pass. In order to shut off the gas, alternating currents of decreasing strength are sent through the line-wire, and consequently through the solenoid B. The rod or core D thereby becomes an inert piece of steel; the valve *a* falls to its seat; and the soft iron mass *c* drops upon the valve, and ensures complete closure.

As a variety of this kind of burner, there may be employed the arrangement illustrated in fig. 4, where the solenoid B, instead of being slipped upon the burner-stem C, is arranged on one side; and its core is adapted to act magnetically upon the soft iron mass *c* above the valve *a*.

Prepaying Gas Supply.—Forster, J. D., of Trafalgar Road, Old Kent Road. No. 28,155; Dec. 9, 1896.

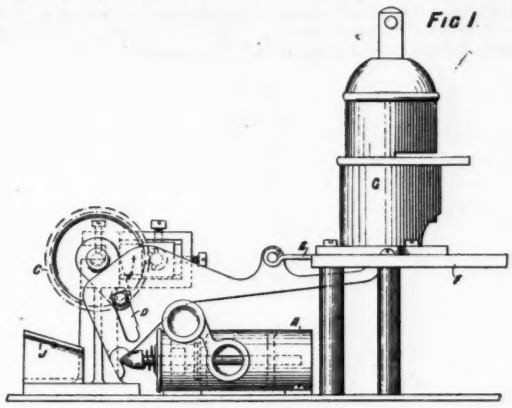
The claim for this apparatus for prepaying gas supply is for "a crank-pin revolved by the index mechanism of a meter; a bar operated by the crank-pin; a projection on the bar acting to open and close a gas-supply pipe from the main to the meter; trunnions on the bar pivoting on a delivery slide of the coin-controlled mechanism; and an extension of the bar, by which the latter may be rocked to open the valve and allow the meter-mechanism to act—such rocking of the bar being effected by a plunger, through the medium of an inserted coin."

Fig. 1 is a side elevation of the mechanism; and fig. 2, a plan. Fig. 3 is a side sectional elevation of the coin-container; and fig. 4, a plan view of the parts shown in fig. 3, but with the coin-container removed.

Gas from the main passes into a cylinder A, and therefrom through the meter for the consumer's use. In the cylinder, there is a division having an aperture controlled by a valve (as shown by dotted lines); and this valve normally closes the passage between the entrance and exit passages. It is mounted on a spindle, passing to the exterior of the cylinder A, and is held open for the passage of the gas by a spring, acting against a conical head on the valve-spindle. In connection with, and operated by, the operative mechanism of the meter-index (not illustrated) is a shaft B, carrying a pinion gearing with a tooth wheel G (carried in suitable bearings), which latter has a crank-arm and crank-pin; the latter being thus revolved at a speed proportional to that of the index mechanism of the meter. The crank-pin passes through a slot D, in a pivoted and sliding bar; the slotted end of the bar being somewhat heavier than its opposite end. At the lowest extremity of the slotted end of the bar, there is a projection which, when the gas is shut off (as shown at fig. 1), is in contact with the conical end of the spindle of the valve, so as to retain the latter in its closed position.

The bar is pivoted to a horizontally moveable slide E; and one end of the bar extends upwards (when the gas is shut off) through an aperture in the slide. Above the slide, which is carried by a guide-plate F, is mounted a circular coin-receiver G, containing a plunger H, from which an operating-handle extends to the exterior of the receiver. The plunger is formed on its under face with downwardly extending side arms or wings, which, when there is no coin beneath the plunger, rest on the guide F of the slide E, and prevent the under face of the plunger from coming into contact with the upwardly extending part of the arm of the bar. The front end of the slide E is cut away sufficiently to allow the coin to pass between its two arms; while the guide-plate F at the part beneath the coin-receiver G, though partly cut away (as shown by dotted lines fig. 4), will still retain a coin; but the opening is increased in size forward of the receiver G, so that, though the coin will not fall away when lying upon the guide-plate F, immediately beneath the receiver G, upon the slide E being drawn away, yet it will pass through upon being pushed by a forward motion of the slide E from beneath the receiver G.

Fig 1.



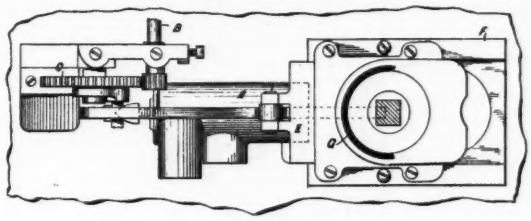


Fig. 2.

Fig 3.

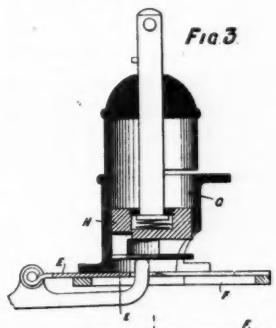
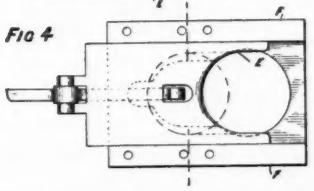


Fig 4



The action is as follows—supposing the gas to be cut off, and no coins being in the coin-container: The plunger H is first lifted; and while a coin is inserted, falls to the bottom of the container, resting upon the upturned end of the bar. The plunger is then lowered; and its wings act upon the coin, which latter (by pressure) forces the end downwards. The valve of the meter is thereby released; the gas-supply pipe opened; and the meter mechanism ready for action. The shaft B, revolved from the meter-index mechanism, actuates the crank-pin by the gearing in the direction of the arrow fig. 1, and lifts the bar—eventually drawing it rearwards, and allowing the projection to rest on the guide-plate J. The bar and its projection, upon leaving the guide, falls in front of the valve-spindle, and further motion of the parts closes the valve. During this operation, the slide E has been withdrawn from beneath the coin; the latter has fallen on to the guide-plate F; and just before the closing of the valve, the slide E, in its return motion, has forced the coin so far forward as to allow it to fall through the aperture of the guide-plate F.

When a number of coins are inserted in the container at one time, the operations are repeated with regard to the bottom coin, but with the exception that the end of the bar is held downwards by the next upper coin, and consequently the gas is not cut off as long as a coin remains in the container. Thus, supposing four coins are placed one upon the other in the coin-container, four times the volume of gas will be continuously delivered.

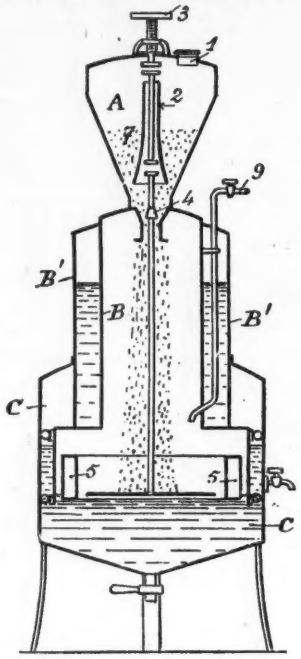
Gas-Engines.—Askham, W., of Nottingham. No. 30,133; Dec. 31, 1896.

This invention relates to self-starters for gas-engines and instantaneous cut-off inlet-valves. The construction of the self-starter is such that only the ordinary pressure in the supply-main is required to gain sufficient explosive force; while the inlet-valve, when opened, admits the first charge of gas into the chamber where the explosion takes place, and forces a portion of air out of the chamber through the starter. This, mixing with the gas in the chamber, forms an explosive mixture. The valve is

then closed; and the explosive mixture is fired from the starter gas-jet light in the usual way. The explosive mixture is thus prevented from being forced back through the closed inlet-valve.

Producing Acetylene.—Tèdè, L., of Angers, France. No. 658; Jan. 9, 1897.

This acetylene apparatus, instead of distributing the water upon the carbide of calcium, provides for the pulverized carbide being distributed automatically in the water proportionally to necessity.

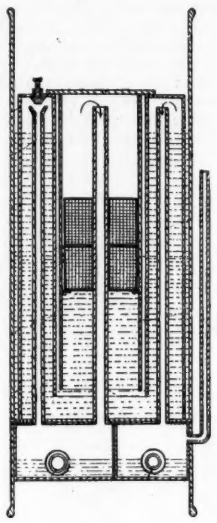


The apparatus is composed of two concentric cylinders B and C, communicating at their under part. The inner cylinder B is surmounted by a receptacle A for the carbide, the under part of which is closed by a valve 4, which can be rendered immoveable by a pressure-screw 3 operating on the upper part of the rod 7, and which, when freed by unscrewing, can be lifted by the annular float 5 fixed to the under part of the rod of the valve. The cylinder acts also as receiver for the small quantity of gas necessary for the regular feed of the burners, and also as protection for the annular float 5. The outer cylinder C serves as a covering for the inner one, and contains the necessary water for the pressure of the gas and for the chemical reaction which operates at the time of the fall of the carbide into the water, and contains also the bye-product resulting from such action. The double wall B^1 of the inner cylinder constitutes a water receiver, intended to cool the gas, and to serve as a weight for keeping the inner cylinder at the bottom of the outer one.

The receiver A being filled with pulverized and sifted carbide of calcium, and the cock 9 closed, water is poured into the outer cylinder C. The screw 3 is turned in order to allow the valve to operate; and the escape-cock 9 is opened. At the beginning, the water contained in the exterior cylinder C enters gradually into the interior cylinder B, and lifts the float 5, which, in its ascending movement, raises the valve 4. Then the carbide falls into the inner cylinder; and the gas produced drives the water from the inner cylinder into the annular ring between the two cylinders, until the float 5, being no longer raised and falling with the rod and the valve 4, brings back the valve on to its seat, and thus interrupts the falling of the carbide. If in this stage gas is consumed, the pressure diminishes in the same proportion in the inner cylinder, and the water will flow back in order to re-establish the equilibrium. The float will then again be lifted; and the operation will be repeated automatically in proportion to the consumption of gas.

Generating and Purifying Acetylene.—Moss, R. J., of Abingdon. No. 1254; Jan. 18, 1897.

This apparatus (as shown) consists of a square hollow container, having extended sides at top for the purpose of holding any water that may be forced above the level of the gasholder in working. The sides of the container act as guides to an inverted cylinder placed therein, which, when the generated gas reaches a certain pressure, acts as a gasholder and, rising, relieves the pressure. The outer wall of the holder rests, under normal conditions, on the floor of the container, as shown, and has perforations at its lower end so as to allow water to freely circulate between the interiors of the holder and the container, or *vice versâ*—the inside wall being made shorter than its outside wall for the same purpose. Centrally supported within the holder by means of its flanged head, is a cylindrical generating chamber not quite reaching to the bottom, having its wall curved inwardly (or inward projections formed thereon), for the purpose of supporting calcium carbide cages therein. These cages are circular in form, and preferably constructed of fine wires about $\frac{1}{4}$ to $\frac{1}{2}$ inch apart. It is also preferable in large appliances to divide the cages into three or four divisions, so that only a small quantity of calcium can be attacked at one time. At the bottom of the container, and formed in one with it, are two rectangular water-pockets or condensers, provided with cocks for regulating the supply of water. These condensers respectively communicate with the gasholder by means of the vertical pipes shown; being also in communication with the generating chamber by a vertical central pipe fixed in the floor of the container, and leading almost to the top of the holder, where it discharges the gas. This pipe, before entering the container, is fitted with a cock for connecting and disconnecting the generator and holder.



The working of the apparatus is as follows: Assuming that the water-cistern has been filled with water, and also the two purifiers or water-cisterns, and the gasholder having been removed, the attendant takes out and charges the generator, replacing the gasholder and expelling all air contained therein by turning on the tap of the pipe connecting the holder and the generator. He now turns this cock off, drops the charged generator into its place (the cock at the top of the generator having previously been turned on to allow air to escape), and turns on the cock connecting the generator with the holder. The latter consequently rises, and having been connected to the generator by a suitable catch, the two work up and down as one until the carbide contained therein is exhausted.

APPLICATIONS FOR LETTERS PATENT.

28,773.—Scarth, J. W., and Thornton, W. A., "Acetylene gas-lamps." Dec. 6.

28,778.—Melhuish, J. B., Guthrie, M., and Hughes, J. H., "A new gas." Dec. 6.

28,798.—Richard, B., "Generating and purifying acetylene." Dec. 6.

28,821.—Thompson, W. P., "Converting into motive force the heat produced by burning gas or vaporized liquid fuel." A communication from P. Irgens and G. M. Brunn. Dec. 6.

28,824.—Bryant, H., "Apparatus for making illuminating gas." Dec. 6.

28,909.—Bronder, G. A., "Machinery for discharging gas-retorts." Dec. 7.

29,008-11.—Bastick, J., and Thornton, W. A., "Manufacture of calcium carbide." Dec. 8.

29,054.—O'Brien, J. O., "Generating acetylene gas." A communication from E. M. Boule. Dec. 8.

29,096.—Drake, J. A., and Marsland, J. S., "Inclined gas-retorts." Dec. 9.

29,103.—Farrington, R., "Preparation for cleaning and strengthening incandescent mantles." Dec. 9.

29,114.—Shears, C. J., "Treating incandescent mantles for illuminating purposes." Dec. 9.

29,115.—Ashton, G. E., "Air-regulator for atmospheric and incandescent burners." Dec. 9.

29,201.—Prevost, E. V., Raus, O., and Cerkel, A., "Production of acetylene." Dec. 9.

29,203.—Chandler, S., jr., & J., "Automatically shutting off the gas supply in cases of buildings on fire." Dec. 9.

29,218.—Yates, H. J., trading as Arden Hill and Co., "Gas-taps." Dec. 10.

29,234.—Russell, W. H., & G. E., "Manufacture of gas." Dec. 10.

29,244.—Guyenot, P., "Lighting and extinguishing gas-burners at a distance." Dec. 10.

29,250.—Saunderson, H., and Barker, J., "Connecting or coupling water-pipes or the like." Dec. 10.

29,258.—Bergmann, F. J., "Acetylene gas-lamp." Dec. 10.

29,259.—M'Culloch, C. H., "Valves for regu'ating the flow of gas into the interior of gas-burners." Dec. 10.

29,270.—Tournet, E. L., "Gas and oil engines." Dec. 10.

29,277.—Evans, E., "Storing carbide of calcium." Dec. 10.

29,304.—Hawes, M. H., Farrington, R., and Hand, W. H., "Gas and oil lighting." Dec. 10.

29,335.—Roberts, W. & M. C., "Light reflectors for incandescent gas-lamps." Dec. 11.

29,361.—Kerridge, J. H., "Electric gas-lighting and controlling devices." Dec. 11.

29,384.—Bergmann, F. J., "Production of calcium carbide in blast furnaces." Dec. 11.

29,386.—Bingham, C., "Incandescent gas-lamps." Dec. 11.

29,393.—Sébillot, A. M. G., "Generating acetylene gas." Dec. 11.

29,401.—Landsberg, V., "Automatic lighter for incandescent gas-lamps." Dec. 11.

29,405.—Maréchal, V., and Moreau, A., "Acetylene generators." Dec. 11.

29,419.—Knopf, W., "Gas-stoves." Dec. 11.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Gaseous Firing.

Sir,—The South Metropolitan Gas Company are carbonizing annually about half a million tons of coal with the settings of tens to which Mr. Fletcher takes exception. I am sorry the drawings have given him such a poor opinion of them. They do, however, heat regularly and evenly, and burn off as much coal as the retorts will hold. From the machine-stoking point of view, the advantages of separating the producer from the settings were cogently stated by Mr. Frank Livesey. At Vauxhall, a double line of rails for coke haulage runs under the settings from end to end, occupying the space usually taken up by the regenerators and producers. By making the production of heating gas a large-scale operation, greater opportunities are afforded for manipulating the producer automatically, and using therein an inferior fuel to coke.

Mr. Fletcher's comparisons are practically with large retorts against smaller ones. But this is quite a distinct matter from that under discussion, since similar retorts can be equally heated in either case. This point is too generally overlooked.

C. C. Carpenter.

Vauxhall, Dec. 18, 1897.

The Collection of Gas Accounts.

Sir,—The communication which appeared in your last issue, from Mr. Shadbolt, was to me an interesting one. The figures he adduced are remarkable, the more so because of the system under which they were obtained. It is indeed questionable if any gas undertaking working under the "discount" system can produce figures to equal them. There is small wonder, therefore, that Mr. Shadbolt should feel called upon to eulogize the "net price" system.

It is not my intention to look at the question from a Longwood *v.* Grantham point of view. These are isolated examples; and in each case the small percentage is but one of degree. Definite data can only be obtained from collective returns; and these would probably be capable of giving the most reliable decision upon the matter. I may add, however, that for the half year to December, 1896, the arrears at Longwood were but £4 5s. 1d. on a total of £3120. Here, therefore, the season does not produce an appreciable effect on the payment of gas bills.

With all due respect to the excellence of the collection of gas-rents at Grantham, I do not concur in the opinion expressed by Mr. Shadbolt that the "net price" system is preferable to allowing discounts. It may be desirable; but as an effective means of getting in the money with a minimum of expense, the discount system "takes the bun."

Mr. Shadbolt offers two objections to the discount system—viz., its comparative costliness, and its effect upon the initial rate charged for gas. But is the argument tenable that, simply because an undertaking decides to allow its prompt consumers a 5 per cent. discount, this of necessity represents the percentage cost of collection? I venture to think that the discount system was adopted originally in lieu of making a reduction in the initial price—a policy that saves the cost of district collection, and dispenses with a large proportion of the "dunning" necessary under the other system.

The effect of allowing discount, so far as the initial price is concerned, is more apparent than real. A low net price may have a certain amount of fascination for the gas engineer; but the average schoolboy can calculate the net cost, even if discounts are allowed, so that there should be little difficulty for the average consumer to do the same. As Mr. Shadbolt states, the net cost of gas supplied at 2s. 6d., less 5 per cent., is 2s. 4½d. This the consumer knows; and if the discount system is abandoned, this must be the initial price. But there being no inducement to the consumer to remit the amount of his bill to the gas office, the appointment of a collector or collectors becomes a matter of course. Then the undertaking is the loser to the extent of the amount paid in salaries for collecting. To me, therefore, it seems that there is little to recommend the subsidizing of the profits of a concern like ours to the extent of £100 per annum in order to claim the sentimental honour of supplying gas at 2s. 10½d. net, instead of 3s. less 5 per cent. So long as the price charged does not approach the maximum price allowed by Act of Parliament, the advisability or otherwise of allowing discounts does not become a serious factor in gas administration; and the Longwood Gas Company, after experience of both methods, have no desire to revert to the older and more disagreeable one of charging net cost price.

J. H. Brearley.

Longwood, Dec. 15, 1897.

The Legitimate (?) Action of Trade Unions.

Sir,—During the past two years, the gas-fitters employed by my department have fitted up about 800 houses with fittings on the hire system; the gas being supplied through prepayment meters. In performing this work, they have taken up floor-boards where necessary, relaid the same after the pipes have been fixed, plugged walls for brackets, and fixed blocks or bridge-pieces for pendants. When a carpenter has been required for such work as altering a cupboard for a meter, or other general work, one has been sent for. A Trade Society have taken the matter up, and have complained that the gas-fitters employed are doing work which is recognized as belonging directly to carpenters; the work so specified being as follows: "Taking up and replacing floors, fixing the necessary wood blocks to carry gas pendants and brackets."

With regard to this matter, I have no feeling personally in favour of gas-fitters, as a trade, over carpenters; but the point involved is this: I contend that gas-fitters are only doing work in my district which, as far as my knowledge extends, they are doing throughout the United Kingdom. Without attempting to arbitrate between trades, I contend that it is for the Society in question to prove that the work done here is not done by gas-fitters elsewhere. In my opinion, no gas-fitter would be considered competent, who could not take up and relay a floor-board and fix blocks for pendants and brackets.

I do not affirm that it is in all cases desirable that gas-fitters should take up and replace floor-boards or plug walls. If rows of houses or streets are fitted up, it might be desirable, and would perhaps be an advantage, to employ carpenters to do the work. It is the question of freedom that is involved. If it comes to splitting hairs, a bricklayer might say that cutting a hole through a wall for a pipe or for wood plugging is his department. Here, again, it is not contended that cases do not frequently occur when it is necessary to employ a bricklayer. It is the question of how far the hands of the gas-fitter are to be tied.

I must not, however, omit one other point raised by the Society, and it is this: "In their opinion, it was quite as necessary for a carpenter to be engaged with the gas-fitter as for a plasterer." If, in the future, a gas-fitter is to have a carpenter, a bricklayer, and a plasterer with him, with about three labourers and a boy in addition, to each job, I fear the lot of the householder will not be pleasant.

A Manager.

Dec. 17, 1897.

The following is the letter bearing upon the question raised by our correspondent which, as mentioned in our editorial columns, was recently addressed to the Editor of the "Ironmonger."

Sir,—We were asked to tender for the gas lighting of the New Empire Theatre, Nottingham, to the specifications of Mr. Matcham, the architect. Our contract was accepted, and we commenced the work, when a deputation from the Operative Plumbers' Society waited on the Clerk of Works and said that, unless members of the said Society did the work, the plumbers engaged on the job would leave. Within two hours of this notice the plumbers all came away, and threatened to withdraw the other federated trades unless we were removed. To-day they appealed to the Federated Trades' Council, who support them in their contention; and they have given us notice that all the federated trades will be at once withdrawn from the job unless we are stopped. We have kept a number of gas-fitters for many years, and this question has never occurred before. The plumbers claim gas-fitting as a part of their business; and they will not work unless Society plumbers finish the job we have commenced. We feel that this contention, though a local one at the present time, will extend farther; and we should like all gas engineers and others who are interested, to let us know their views on the subject. We have drawn up a case for Counsel's opinion, and are prepared to carry the matter farther if we have the Ironmongers' Association and the trade generally with us. We enclose you a copy of one of the plumbers' bye-laws, which runs as follows: "We do not allow ourselves to work on any job where we come in contact with ironmongers, tinmen, or any other workmen, except plumbers, who are infringing on any part of our trade."

Thomas Danks and Co.

The following letter on the above subject from "A Sympathizing Lincolnshire Ironmonger" appeared in our contemporary last week:—

Sir,—I have read with feelings of burning indignation the recent experience of Messrs. Thomas Danks and Co. with the plumbers of Nottingham; and I think it is the duty of every ironmonger in Great Britain to unite against this increasing terrorism of Trade Unionism. Here is a matter that should occupy the immediate attention of the new National Hardware Association, in comparison with which every other subject already entertained fades into insignificance.

The Abortive Gas and Water Purchase Bill of the Lowestoft Corporation.—The Lowestoft Corporation have had to pay dearly for the Bill they promoted in the last session of Parliament for the transfer of the gas and water works, and which was rejected by the Lords Committee. The bill of costs, the Town Clerk reports, amounts to £1766 10s. 5d.

Alleged Pollution by the Giltbrook Chemical Works of the Nottingham Corporation.—For some years past a little soreness appears to have existed between the Basford District Council and the Nottingham Corporation in connection with the chemical works of the latter, which are charged with being responsible for the pollution of the Giltbrook. Long ago the Town Clerk of Nottingham stated that it was a "mathematical impossibility" for any such pollution to be carried on by the works; but the Chairman of the District Council (Mr. R. G. Hanson) says it is not only perfectly possible, but is absolutely certain to happen. He also thinks the Council have "winked" at this matter long enough; and, agreeing with him, the members last Tuesday passed the following resolution: "That this Council are of opinion that the greater portion of the pollution of the Giltbrook is due to the action of the managers of the Corporation chemical works in using the effluent from the Kimberley tanks for refrigerating purposes, and then sending it on to the Giltbrook in a state of putrefactive fermentation, and to the escape from the works of certain coal-tar products, which, on mixing with the sewage effluent, cause a nuisance; and that Mr. R. Barber be appointed to go into the matter, and be authorized to take such legal proceedings as may be necessary to remove the above-named nuisance at once."

Proposed Water-Works Improvements at Hull.—In the "Journal" for the 7th inst., we gave particulars, obtained from a local source, as to the improvements which the Water Engineer of the Hull Corporation (Mr. F. J. Bancroft, B.Sc.) proposes should be carried out. We have since received from him a copy of the report he has presented to the Water Committee on the matter, and are therefore now in possession of more reliable information than that previously available. First of all, Mr. Bancroft recommends the provision of a service reservoir, so as to place the supply upon a thoroughly satisfactory basis. In considering its capacity, he thinks it should be large enough to contain 1½ days' maximum consumption in 1921, say 25,200,000 gallons, *plus* one-tenth for depth below which it would not be desirable to draw—together 27,720,000 gallons; so he recommends a minimum storage of 30,000,000 gallons. For this reservoir, 15 acres of land would be required; and it could be obtained in the vicinity of the Asylum at Willerby, which is sufficiently high to allow of a supply by gravitation to nearly the whole of the area within the Corporation's water limits. He puts the cost of the reservoir at £60,000. He recommends the laying of a 36-inch main from each pumping-station to the reservoir, at an estimated cost of £35,000; the provision of a duplicate 30-inch main to connect one of the new mains with an existing 25-inch pipe, at an estimated cost of £20,500; and the laying of a 12-inch main to lessen the double pumping now required to the suburban district, at a cost of about £3000—making an approximate total, exclusive of land, of £118,500.

LEGAL INTELLIGENCE.

YORKSHIRE AUTUMN ASSIZES—NISI PRIUS COURT.

Wednesday, Dec. 15.

(*Before Mr. Justice* KENNEDY.)

Damages Sustained through a Gas Explosion—The Steam-Roller Trouble.

John Taylor, a steelworker, and Frederick Charles Kirkwood, an apprenticed fitter, were the plaintiffs in two actions brought to recover from the Southbank District Council and the Southbank Gas Company damages for personal injuries caused through an explosion of gas.

Dr. LENNARD appeared for the plaintiffs; and Mr. MANISTY for the defendants.

According to the statements of Counsel and the evidence, it appeared that the streets at Southbank were laid out about thirty years ago; loose slag from the iron-works being used for the foundation, and powdered slag placed on top. In course of time, the gas-mains were laid in the slag—in places less than a foot from the surface. The District Council were responsible for the repair of the streets. Shortly before Nov. 17 last year, some of the streets were under repair with slag; and on that date a steam-roller weighing about 12 tons passed over the slag and fractured a 2-inch main. Shortly afterwards the Manager of the Gas Company (Mr. W. Nixon) noticed that the gas was escaping, particularly in the house of a man named Taylor; and he advised the occupants to clear out, and to extinguish a paraffin lamp which was burning. An explosion followed; but no one was injured, though the house was in ruins. The plaintiffs, hearing of the explosion, went out of curiosity to the scene; and while they were standing near a shop occupied by a man named Daly, another explosion took place. Daly's house was reduced to ruins, and the plaintiffs were covered with the *débris*. The plaintiff Taylor had his scalp lacerated, nose broken, and the muscles of his back wrenched. He was from work for nine weeks; his wages having been £1 13s. a week. Kirkwood was away from work a week; but he had felt the effects of his injury for a much longer time. The negligence alleged against the defendants was that, notwithstanding that the escape of gas was known before either explosion took place, no steps were taken to turn off the gas, or to warn the public of the danger they incurred. Dr. Steel, however, declared that, before the second explosion took place, he had warned the people of the danger, and the crowd had been ordered out of the street by the police. As to turning off the gas, Mr. Nixon stated that he did not adopt the suggestion, because it would have thrown the station and the iron-works in darkness. From other evidence, it appeared that there were eight policemen engaged in clearing the street between the first and second explosions. A half-drunken man struck a match to light his pipe; and the second explosion followed immediately. It was also asserted that the plaintiffs were personally warned of the possibility of another explosion, and that they were told that, if they persisted in remaining, they would do so at their own risk.

The jury found for the plaintiffs; awarding Taylor £40 damages, and Kirkwood £30.

The South Staffordshire Water-Works Company v. Barrow—The Basis of Charge for Water-Rate.

The long-standing dispute between the South Staffordshire Water-Works Company and Mr. H. M. Barrow was brought to a close at the Burton-on-Trent Police Court, last Friday, when the Company, through Mr. Showell Rogers, applied to the Bench to fix the annual value of the tenement occupied by Mr. Barrow, at Winshill, for the purposes of the assessment of the water-rate. Originally the Company contended that they had the right to charge either on the gross or net annual value of the premises; but the County Court Judge (Mr. Smyly, Q.C.) decided that they could only levy on the net annual value. This decision was upheld in the Divisional Court and the Court of Appeal (*ante* p. 275); and the Company accordingly asked the Magistrates to fix the net value. In the course of evidence, it was stated that Mr. Barrow's house was assessed at £25; but the Company contended that it was grossly under-assessed, like many other houses in the locality. After a long hearing, the Bench said they adhered to their decision given in March, 1896, when they fixed the gross value at £28, treating the case as *res judicata*. With reference to the net value, they considered that 15 per cent. was a fair deduction; leaving the net value £23 15s.

Liability of Voluntary Schools for Water-Rates.

At the Bakewell County Court, his Honour Judge Smyly, Q.C., has delivered judgment in a case brought by the Bakewell District Council against the Bakewell National School Trustees for the recovery of £1 2s. 8d., being the first and second instalments of a water-rate owing to the Council. There was a similar claim for 5s. 8d. against Mr. J. Bowen, Trustee to the Bakewell Wesleyan Day School; and in both cases the defendants claimed exemption under the Voluntary Schools Act, 1897. His Honour said the sole question raised before him was whether the charge for water was or was not "a local rate in respect of lands or buildings." He had considerable doubt whether the question was not entirely covered by a case in the Court of Appeal—*Badcock v. Hunt* (1888), 22, Q. B. Div., 145—in which a water-rate was held not to fall under the words, "all rates, taxes, and impositions whatsoever, whether parliamentary, parochial, or imposed by the Corporation of the City of London, or otherwise howsoever." That case threw great doubts upon that of the *Direct Spanish Telegraph Company, Limited v. Shepherd* (13, Q. B. Div., 202), where "water-rate" was held to fall within the terms of a covenant therein considered. But though the Court of Appeal were not quite satisfied as to the last-named case, they did not overrule it. If, however, the decision of that Court did not go so far as to cover all cases of water-rate, he thought that it certainly did decide that payment for water supplied, if it was voluntary, whether the supply was taken or not, was not a water-rate. Under the circumstances, there would be judgment for the plaintiffs in both cases; and he gave leave to appeal if defendants wished to question his decision.

MISCELLANEOUS NEWS.

GLASGOW CORPORATION GAS SUPPLY.

Official Visit by the Gas Committee to the Works.

Last Tuesday the Gas Committee of the Glasgow Corporation paid an official visit to the three large gas-works under their charge. Invitations to attend the ceremony were sent out, in the names of the Lord Provost and the Convener of the Gas Committee, to members of the Town Council who are not on the Committee, and to a few others. Close upon ninety gentlemen were present. Lord Provost Richmond was unable to attend the assembly of the company, which took place at the City Chambers. Mr. R. M. Mitchell, the Convener of the Committee, received the visitors, assisted by Mr. J. Fleming, the Treasurer of the Gas Department of the Corporation. Carriages were waiting; and in these the long drive to the Tradeston works, on the South Side of the city, was made. Mr. W. Foulis, the Gas Engineer to the Corporation, there took charge of them; and they were also received by Mr. J. Wilson, the Station Manager. As the works were approached, the large new holder which was completed last year was observed to be nearly full; the register showing 4¾ million cubic feet.

The first place visited was the governor-house, in which, as showing the wide and diversified area served from the works, there are seven governors. In the same building there are three station meters, each of a capacity of 120,000 cubic feet per hour. The purifier-house was next visited. This is a spacious and airy apartment, containing sixteen purifier boxes, each 35 feet square. The last set of four of these has just been completed. On leaving the purifier-house, a branch of the Caledonian Railway, which intersects the works, was crossed, and the arrangements for washing and scrubbing the gas were looked at. These consist of two of Kirkham, Hulett, and Chandler's patent washer-scrubbers, and two of Messrs. C. & W. Walker's patent gas purifying machines. In the exhauster-house there are four sets of machines, of which three were at work. The retort-house was taken last. There are four benches, each containing 272 retorts—1088 in all. The retorts are set back to back, eight in an arch, and are 9 feet long, and 21 in. by 15 in. diameter. The benches are fitted with coal breaking and elevating plant, and are charged and drawn by the Arrol-Foulis stoking-machines. The visitors had the opportunity of seeing some of this work performed; and it was being most efficiently and expeditiously done. Mr. Wilson stated that he had been getting very good heats of late, which was evident from the fact that not a particle of green coal was drawn—the charges having been in 3¼ hours. The purity of the coke also testified to careful stoking. Those who had never been in the works before were greatly struck with the efficiency of the equipment of the retort-house. What seemed to attract as much attention as anything was the diminutive steam locomotives employed to drag out the coke-waggons from the lower flat. The works are now all but filled to their utmost capacity with plant—one bench of retorts only standing idle. The maximum output now is about 7½ million cubic feet of gas per day. A feature of the works which was not specially looked at is a set of three lime-kilns, in which the lime used for the purifiers is burned.

A special train was waiting in a siding in the Caledonian Railway Company's yard, alongside the works; and in it a smart ride of ten minutes (going by Rutherglen) brought the party to Dalmarnock. In the works there, they were met by Mr. J. Manwell, the Station Manager. The works outwardly have a monumental appearance, being built in heavy stone ashlar work; while a long row of giant condensers, painted cream colour, gives the side of the retort-house a resemblance to an Egyptian temple. These works were ten years ago the most up-to-date of any in the city. Now, such has been the advance in the improvement of gas plant, they are hopelessly left behind. The monumental nature of the retort-house is in part responsible for this, because, the house being too small to admit of coal-handling appliances being fitted up, the cost of re-arranging or re-constructing the building would be so much greater than in the case of a brick building, that it has not yet been attempted. Besides, the works are intersected by a public street; and generally there is not much room. In the retort-house, which was first visited, there are drawing, but no charging machines—the latter work being done by hand. It was surprising to many to see how deftly it was done—the men working in couples, and keeping time like soldiers on the march. There are no coal-breaking machines, nor elevators; and the coal is brought to the retorts and the coke taken away by means of horses. There are two benches of retorts, in settings of eight, and containing in all 832 retorts. The output of gas is from 7½ to 8 million cubic feet per day. There are four governors, three station meters, each of 140,000 cubic feet per hour capacity, and twelve purifiers, each 35 feet square. Before leaving the works, the attention of the company was directed to a consignment of 8-inch gas-pipes from Philadelphia, which had just been delivered; and they excited some interest. They were rough in the body, as compared with home-made pipes; but, as a gentleman expressed it, the turned parts were simply perfection.

The train was then joined again, and a journey of twenty minutes, by the Central Underground Railway, brought the party to Dawsholm Station, the terminus of the line, on the opposite side of the River Kelvin from the Dawsholm works. A siding goes into the works on the low level; and by this the visitors entered. They were met at the gate by Mr. A. Wilson, the Station Manager. The Dawsholm works are now the largest and the best-equipped of all three. On their way to the retort-house, the visitors passed a range of five lime-kilns at work. There are three retort-houses, containing respectively 832, 512, and 320 retorts—the last house not yet being fully occupied. There are railways overhead and on the levels, coal-breaking machines, coal conveyors, charging and drawing machines, and locomotive haulage for the coke. The last-built section of retorts is a novelty. It consists of eight arches, in each of which there are twelve retorts—in four rows of three each—but only seven ascension-pipes. This is accomplished in the following way: The centre retorts in the upper row and the second row from the top have each an ascension-pipe; but in all the other cases there is only one pipe to two retorts—the mouthpiece of the one retort communicating by a pipe of the same diameter as the ascension-pipe, with the mouthpiece

immediately above it. The system is said to work well. It has the double advantage that 50 per cent. more gas can be made on the same area, and that no more heat is required for twelve than for eight retorts. The present capacity of the works is about 13 million cubic feet of gas per day; but when completed it will be about 18 millions. There are two exhauster-houses, in one of which there are two sets of machines, with room for two more; while in the other there are three sets. There are four washer-scrubbers; five of C. & W. Walker's purifying machines, and two station-meter houses, in one of which there are two meters of 120,000 cubic feet capacity each, and in the other four of 100,000 cubic feet capacity each. There are three purifier-houses—in one 24 purifiers, each 25 feet square; in another, 12 purifiers, each 30 ft. by 25 ft.; and in the third, which is not yet completed, 4 purifiers, each 36 ft. by 25 ft. The Dawsholm works are separated from the other section of them, which was formerly the works of the Partick, Hillhead, and Maryhill Gas Company, by the Forth and Clyde Canal. The company walked over to the works, which are not now much depended upon for gas production, though the plant is being gradually worked out. In them both the charging and drawing is done by hand; and the settings of retorts are in fours. In this section of the Dawsholm works, however, is the most recent plant of all, in the shape of Mr. Foulis's apparatus for making gas from oil. There are two sets of plant; but only one set was heated up, and it was not in operation at the time of the visit. Mr. Wilson explained how it is worked. There are three vessels, similar to those used for the production of carburetted water gas. The first of these is the producer. From it the water gas is led to the bottom of vessel No. 2, where there is a square-shaped brick structure, in which the gas is burned, for the heating of vessels Nos. 2 and 3. The oil is admitted in a fine spray, at the top of No. 2; and in this it is vaporized, but not made into permanent gas. For fixing, it is sent through vessel No. 3, which is close alongside. It was stated that there was a good yield of gas, of about 120-candle power, and very little condensation. On leaving the retort-house, the company had a look at the excavation which is being made for the new 5 million cubic feet gasholder about to be erected close beside the original large one which the Corporation put up some years ago. The excavation is chiefly in sandstone; and it appeared to be very slow and tedious work. The depth of the tank is to be 45 feet; and but little more than half of this has been accomplished.

This was the close of the inspection, and the Company repaired to a store-room, where luncheon was served. Lord Provost Richmond had by this time joined the party; and he presided.

In proposing the toast of "The Engineer to the Glasgow Gas Department," coupling with it the name of Mr. Foulis, he said that with the intimate knowledge he had had of Mr. Foulis for many years, he could speak of him as one of the foremost of gas engineers in the country. They in Glasgow knew what he had done for them in the past. They valued his services; and they believed he would keep them up to, and probably in advance of, all the improvements being made in the industry of gas making. Mr. Foulis, in a sentence, returned thanks.

The special train had been brought to the end of the works, where the inspection terminated; and the return journey was made to the Central Underground station, where the party dispersed.

CONTINENTAL UNION GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, 7, Drapers' Gardens, Throgmorton Street, E.C.—Mr. Arthur Lucas in the chair.

The Secretary (Mr. F. W. Himing) read the notice convening the meeting, and also the following report of the Directors:—

The Directors regret to have again to commence their report by recording the death of a colleague—viz., that of the late W. T. Shorthose, which occurred on the 19th of February. The vacancy thus created has been filled up by the election to a seat at the Board of Mr. J. Horsley Palmer, whose experience in gas matters will be of considerable advantage to this Company.

The Directors have to report that at Messina and Montargis, the two stations owned by the Continental Union Gas Company, the increase in the consumers has been 9 per cent., and in the quantity of gas sold 2½ per cent.

The total spent on capital account, during the year, at these two stations amounts to £4587, and includes a new retort-house at Messina, fitted with four beds heated by regenerator furnaces; new mains, services, and public lamps at both stations.

At Messina, the Directors considered it politic to reduce the price of gas by 2 c. per cubic metre from the 1st of January last; and this has affected the profits to the extent of about £240 for the six months to June 30 last.

As stated in the Union des Gaz report, the open questions with the town of Milan have now been finally settled, and that Company, in which the Continental Union is so largely interested, has now acquired the right to supply gas, not only to the City of Milan, but also to its rapidly growing suburbs, until Dec. 31, 1925. To obtain this prolongation, considerable reductions have had to be made in the selling prices of gas, commencing from the 1st of February last.

Another small Commune—viz., that of Louveciennes—has been added to the territory lighted by the gas-works at Rueil, near Paris—a station which gives great hopes of a very prosperous future.

The Parma works and mains have now been sold; the Concession not having been renewed, as referred to in the last report.

The average length of the concessions of all the towns lighted by both Companies is now 28 years.

The total amount debited to capital account by the Union des Gaz for works finished during the year under review, amounted to about £48,000, chiefly for retorts with regenerative furnaces at Milan, Cette, Rueil, Strasburg, and Alessandria, purchase of land and houses at Genoa and Roanne, new gasholder and tank at Milan, new retort-houses at Roanne and Vienne, new purifiers at Rueil, and new public lamps, mains, and services at the twelve stations generally.

The following statistical information relating to the working of the Union des Gaz stations is, as usual, given here: The average quantity of fuel used for heating the retorts shows a considerable decrease at those stations where an opportunity has occurred of introducing the system of regenerative furnaces. The average cost of coal has increased nearly 9d. per ton, and recent advances in freights point to a still further increased cost of coal during the current year's working. The net value of the coke sold has decreased to the extent of 1s. 5d. per ton. The values of ammoniacal liquor and other residuals also show a decrease. Tar, on the other hand, has increased in value 1s. 3d. per ton. The bad debts incurred and written off profits amount to £520; being considerably less than in the preceding year. There has been a net increase of only 123 public lamps, due to the fact that the public lighting of several of the streets at Genoa is now carried out by the recently established Electric Lighting Company there. Of private consumers on the books of the Union des Gaz on June 30 last, the number shows the satisfactory increase of 9588, equal to about 12 per cent., and making a grand total of 90,297 consumers supplied by that Company at their twelve stations. The quantity of gas sold for all purposes shows an increase of only about 4 per cent.

It will be seen on reference to the report of the Union des Gaz that, owing to reductions which have had to be made in the selling prices of gas, the increased cost of coals and labour, and the less value of residual products during the past year, that Company has had to reduce its dividend by 2 per cent.

Referring to the balance-sheet of the Continental Union Company, it will be noticed that its holding in Union des Gaz is reduced by fifty shares, the profit on the sale of which has been carried to the credit of Messina sinking fund. The capital employed at Messina has now been reduced from £99,764, at which it stood on June 30, 1895, to £95,888. This reduction the stockholders will be asked to approve by means of a formal resolution, which is required by the Fiscal Authorities in Italy.

After making the usual charges, the net profits of the Continental Union Gas Company for the year ending June 30 last amount to £103,296 13s. 2d. The available sum to the credit of general revenue is £141,273 12s. 8d., out of which the Directors recommend a dividend at the rate of 12 per cent. per annum on the ordinary stock and 9 per cent. on the preference stock.

After deducting the interim dividends paid in July last, and paying the balance of 7 per cent. on the ordinary and 5½ per cent. on the preference stock, the amount carried forward to the new account will be £34,473 12s. 8d.

It is proposed to pay the dividends on the 4th of January next, free from income-tax.

The Director who retires by rotation is F. Tendron, Esq., and the Auditors (A. T. Eastman, Esq., and I. A. Crookenden, Esq.) also retire, all of whom, being eligible, offer themselves for re-election.

The Chairman, in addressing the proprietors, said it was his sad duty, as it was last year, to refer to a loss the Board had sustained. As they had heard, Mr. Shorthose passed away in February last; and in him they had lost an amiable colleague, and the Company an able Director. It was true he was only on the Board a short period. But during that time, he won the respect and esteem of his colleagues; and he (the Chairman) did not like this occasion to pass without saying a few words deploring his loss. In his place, they had elected Mr. J. Horsley Palmer. He was known to many of them as a gentleman of great experience in gas matters. He was not only the Chairman of an English Company, but he was (what was more important to them) the Deputy-Chairman of a Company whose business was similar to their own; and he was sure—having had the pleasure of working with Mr. Palmer on the Board of that Company for many years—that he would bring great knowledge and varied experience to the business of their Company. He felt confident that the action of the Board in this respect would commend itself to the proprietors. Turning to the business of the past year, he proposed first to take into consideration the affairs of the Continental Union Gas Company and then pass to those of the Union des Gaz, in which they held so large a stake. The Continental Union Company owned two stations—Messina in Sicily, and Montargis in France. The gas sold at these stations had increased by 63,869 cubic metres. He mentioned this because it showed that, notwithstanding a certain amount of competition with the electric light at Montargis and other troubles at Messina, they had been able to hold their own, and increase their business. At Messina, as the proprietors would remember was duly reported to them last year, there was a fearful earthquake; and it was a question whether they could send gas through the pipes at all. The leakage last year was very great; but they had been able to reduce it by 3¼ per cent. However, it still stood too high—viz., 15 per cent.—and he trusted they would be enabled, after a very careful inspection, to further lessen it. The number of consumers at the two stations had increased by 395, which was most satisfactory. The net profits showed a decrease of £1006. Now this was partly due to their own action—the reduction of the price of gas at Messina by 2 centimes. It was true residuals had not been so profitable; but he would deal with them later, as the same questions which affected the great station of the Union des Gaz—Milan—to a certain extent affected Messina. The net profits on the whole undertaking were £103,296, against £116,258, which was a decrease of £12,962. Inasmuch as the total amount required to pay the dividend was £106,800, and as they had earned £103,296, they had a difference of £3504 to make up. Therefore, they would have only £34,473 to carry forward, as against £37,977 last year. This position was not wholly satisfactory; and the reason for the diminution in the dividends led him to the affairs of the Union des Gaz. As the proprietors had heard from the report, the dividend of that Company was 2 per cent. less than last year. But when they came to look at the business, it would be seen at once that it was not so bad as it appeared on the face. Last year they sold no less than 2,223,909 cubic metres more gas than in the previous year; and they had an addition of 9588 to the number of consumers. But the net profits showed a decrease of £25,448; and it was with this decrease that he had to deal. First, coal had cost much more. It would interest the proprietors to know that the freights to Italy were exactly double what they were two years ago. They then paid 4s. 6d. per ton; while now they were paying 9s. Coke had not had such a good sale on account of the warmer winter last year. Ammoniacal liquor had fetched less; and the only rise had been in tar. Labour (which he foreshadowed last year would cost more) had risen 2½d. per ton of coal carbonized. It would thus be seen that all the residuals were more or less unsatisfactory, with the exception of tar. For some reasons, he might wish that this year they would have a more severe winter; but it would be heartless, on account of the poor, to hope so. It was really the City of Milan, and partly the City of Genoa, which had caused the deficiency. As no doubt some of the proprietors were not cognizant with the rather complicated state of affairs that existed twelve months ago in Milan, he explained that the Union des Gaz had up to last year two concessions from the authorities: One for the Interior, lasting till 1910, and exclusive, and another which ran till 1925, but was non-exclusive—that was, any other competitor could come into the field, with the permission of the Municipality, lay down pipes, and compete

with the Union des Gaz. Then there was a second concession for the Exterior, which lasted to 1912. A few years ago, in the Exterior, they had the opposition of a Co-operative Society; but although this Society did not do a profitable business, yet they took a certain number of customers away from them, and gave a great deal of trouble. The situation was further complicated by the Co-operative Society letting the manufacture of gas to an Italian Society; and the result was that, with the high taxes imposed by the State and Municipality, the trouble caused by the consumers (especially the grumbling at the high price both in the Interior and Exterior), and the friction with the two Societies, a very complicated state of things existed in Milan. When he met the proprietors last year, his lips were to a certain extent closed, because, as he then informed them, active negotiations were pending; but on this occasion he was happy to be able to announce that the negotiations were brought to a satisfactory issue. They had the same state of things in the Interior that he had described, so far as the dates of the concession went; but they had been able to increase the concession in the Exterior from 1912 to 1925. This, he thought the proprietors would allow, was satisfactory. He had dwelt at length on the City of Milan, because of its great importance. He asked them to mark the large increase that had taken place in the population during the last ten years. In 1886, the population consisted of 362,709 souls; while now it consisted of 462,709, and they might fairly say that, before many years, it would be 500,000. They all knew that the future of gas companies depended very much upon getting the suburbs of the cities and towns supplied, because it was in the suburbs that extension took place. Therefore, he thought that great credit was due to the gentlemen who carried out the negotiations so successfully last year. Most of the members of the Board had had a very anxious time during the past few years. They went out to Milan in connection with this matter; but it was finally left to Mr. R. Hesketh Jones, M. Salanson, of the French Board, M. Solanges, the Manager at Milan, and Mr. Himing and M. de Savignac, their able Secretaries, to solve the problem, and arrive at the satisfactory result he had mentioned. Of course, the proprietors would ask, What have you paid for this? They had paid, and were paying, very heavily. They were paying for it by lowering the price of gas; and this had affected the French dividend, as he had said, by 2 per cent. The reduction took effect from February last; and therefore it only affected five months of the accounts of the past year. It followed that it would have a greater effect in the current year; so that it was his duty to tell the proprietors that there was no prospect of an increase this year. But it was almost a moral certainty that there would be a further small decrease in the dividend. What he had said with regard to Milan, so far as price was concerned, applied in a certain degree to Genoa. There they had had to reduce the price, though not to the same extent as in Milan. He hoped that the moral influence that had been exercised in Milan would have some influence with the authorities elsewhere. The Union des Gaz were always ready to let the inhabitants of a town, when there was an honest and real demand for a supply of gas, have it on lower terms, if the inhabitants could justify those terms. He was afraid he had had to paint a rather gloomy picture; but there was really a strong ray of sunlight on the otherwise rather sombre landscape. He was warranted in saying so, because the increase in the number of consumers and the amount of gas sold during the past twelve months, owing to the large reduction in price that had already been made, justified them in hoping, at least, that they would be recompensed to a certain extent for the great sacrifices they had made, and that in time to come they would be able to pay a fair dividend on their stock. The truth was the whole nature of the gas business on the Continent was changing. He was not prophesying; his remarks were based on present experience. They would have to produce a much larger amount of gas, and have to supply it at a lower rate than they had done hitherto; and for this purpose they would require more capital. As the proprietors knew, according to the practice in France, the capital had to be raised by bonds; and he thought it would be a satisfaction to them to learn that, during the past few weeks, the French Board had been able to issue 500 franc bonds, which carried 3½ per cent. interest, at the exceptional price of 485 frs. This clearly showed that the credit of the Union des Gaz in Paris was most satisfactory. He had endeavoured to the best of his ability to give the proprietors definite information; and when they left the meeting, he would ask them to remember that, although there was a diminution in their profits, and in all likelihood there would be a diminution next year, yet there was a bright future before them. He was quite sure that the prosperity of the Union des Gaz, if one might be allowed to speak with any certainty of the future, was assured; and for many years to come, they would have a prosperous business. He concluded by moving the adoption of the report.

Mr. N. E. B. Garey seconded the motion, which was unanimously carried.

The Chairman said he had next to move a special resolution—"That the reduced amount of £95,888, appearing in the balance-sheet as being the amount of capital now employed at Messina be and is hereby formally accepted and approved." He explained that this resolution was a purely formal one, and was merely to satisfy the Fiscal Authorities at Messina.

Mr. F. Tendron seconded the motion, which was adopted.

On the proposition of the Chairman, seconded by Mr. R. Hesketh Jones, the dividends recommended in the report were declared.

The Chairman next moved, and Mr. Garey seconded, the re-election of the retiring Director, Mr. F. Tendron.

The motion having been passed,

Mr. Tendron, in responding, spoke of the candour and frankness with which the Chairman had addressed the proprietors, and urged them not to be discouraged by the temporary diminution in the dividends.

The Auditors (Messrs. A. T. Eastman and I. A. Crookenden) were also re-appointed.

The Chairman proposed a hearty vote of thanks to the Secretary, Managers, and Engineers of the Company and of the Union des Gaz for the services they had rendered during an exceptionally trying year.

Mr. J. Horsley Palmer seconded the motion, which was unanimously carried.

Mr. H. D. Ellis, in moving a vote of thanks to the Chairman and Directors, alluded to the cheerful tone with which the Chairman had referred to the future, and remarked that, though it was irksome and disagreeable to have to put up with enforced reductions of price, the fact of the price being reduced would bring them more consumers.

Mr. W. Westcott seconded the motion, which was cordially agreed to.

The Chairman, in acknowledging the compliment, confessed that he had been caused much anxiety in considering how to place the position of the Company clearly and fairly before the proprietors. But he was more than rewarded by the way in which they had received his statement; and he was sure this feeling was shared by his colleagues.

This concluded the proceedings.

WINDING UP OF THE BELGRANO (BUENOS AYRES) GAS COMPANY, LIMITED.

An Extraordinary Meeting of the above Company was held last Friday—Mr. C. P. Ogilvie presiding—for the purpose of considering resolutions agreeing (1) to the Company being wound up voluntarily, and (2) appointing Mr. A. T. Hooper the Liquidator for winding up the affairs of the Company and distributing the property.

The Chairman said an extraordinary meeting was held on April 27 last for the purpose of passing a special resolution to the effect that the Company should sell itself to a new Company, to which also the Argentino Gas Company had made arrangements to sell itself. The resolution was confirmed on May 18; and, as a natural consequence, they were meeting that day for the purpose of winding up the old concern. The Company had passed through troublous times; but he was glad to say he thought they were now in smooth waters. The steps taken by the Directors had been most carefully considered; and he did not think they could have arrived at a better solution of the fair value of the two undertakings than the agreement which had been made with the Directors of the new River Plate Gas Company. He wished to call attention to the position the Company were in when they first contemplated this fusion of interests. They had then been steadily working upwards from the time when he unfortunately had to meet the shareholders without a dividend. Then they got into smoother water, and were able to pay a dividend; and from that time the dividend and business had continued to increase. But it was an utter impossibility to go on extending the business without enlarging the capital; and they had reached the stage when the Directors would have had to apply to the shareholders or the public for further money. The questions, however, arose, should they face the large capital expenditure which was necessary, and go on fighting the Companies that surrounded them, or should they join one of the other large Argentina Companies. The Directors knew that, unless some such combination took place, if two of the other Companies had amalgamated, the Belgrano Company would have been squeezed out. The Directors would not only have had to apply to the shareholders for further capital, but he was afraid the time would have come when they would not have been able to pay a dividend on the increased capital. Having related the circumstances that led up to the suggested amalgamation, he reminded the shareholders that, where competition in gas supply existed, there must be duplicate mains; and this caused an unwise expenditure of capital. The new Company were now considering the question of taking up part of the mains, and using them for the benefit of the united concern. From their earnings, they (the Belgrano Gas Company) had spent something like £68,000 in new mains and in enlarging their business. In this way, they had put the concern in such a position that the new Company had given them something more than £25,000 in addition to their capital. The whole of their staff in Buenos Ayres had been taken over by the new Company; and while this was satisfactory to the staff, it was also satisfactory to the Directors, for it enabled him to fulfil the suggestion he threw out in April last as to giving the shareholders £1 bonus for every £10 they held in the old Company. The new Company were in a very satisfactory position; and after that day the Belgrano shareholders would be receiving interest on £11 for each £10 now held. After the experience they had had in Argentina, the new Company would be bound to build up a reserve, which should be invested in gilt-edged securities; so that there would be something substantial to draw upon if at any time the earnings were not sufficient to maintain the dividend. He explained that for the £1 bonus, they would have to issue fractional certificates, as the nominal value of the shares in the River Plate Gas Company was £10; and it was only for even sums of £100 that full shares could be issued. For the benefit of everybody, he thought they could arrange that the holders of the largest number of fractions should have the right to purchase at par from those holding a smaller number. In this way, he believed the board would be cleared. These bonus shares would absorb £20,000 out of the £25,000; and he wished the shareholders to say how the remaining £5000 should be dealt with. He asked them, however, to remember that they had gentlemen who had helped them immensely in carrying this amalgamation through, and also a staff, some of the members of which had not been overpaid. Having announced that he had received a cablegram stating that the Argentino Gas Company had already handed over their assets to the new Company, he concluded by proposing the adoption of the resolution agreeing to the winding up of the Company.

Mr. Hegan seconded the motion, which was unanimously carried.

The second resolution appointing Mr. Hooper as Liquidator of the Company's affairs, was also passed.

Mr. E. Woolley asked whether the Chairman could give the shareholders a little information as to how the £5000 was to be distributed.

Mr. R. Nesham said that, having been a Director of a Gas Company in Buenos Ayres for nearly twenty years, he could speak from experience in praise of the past management of the Belgrano Company. He knew that the staff (and he mentioned the Secretary particularly) had, having regard to the importance of the Company, been inadequately paid; and the work which had been done by the Directors was entitled to substantial recognition. He therefore thought the shareholders might well leave the division of the £5000 to the Board.

Mr. H. G. Anderson considered the Directors had brought the delicate negotiations involved in the amalgamation to a very satisfactory conclusion; and he agreed that the £5000 should be voted to them to deal with in the manner they deemed most expedient.

Other shareholders concurred with the remarks of the two last speakers;

and a resolution was adopted to the effect that the balance over and above the amount required to supply the shareholders with £11 for each £10 share be handed to the Directors for disposal as they thought fit.

A further resolution was passed cordially thanking the Chairman and Directors and staff for their services.

The CHAIRMAN suitably acknowledged the confidence of the shareholders; and the proceedings terminated.

MIDDLESBROUGH CORPORATION GAS BILL.

The Recent Adverse Vote of Ratepayers—Alderman Bell on the Necessity for Extending the Works.

At the Meeting of the Middlesbrough Town Council last Tuesday, the question of promoting a Bill in the ensuing session of Parliament for obtaining power to incur certain expenditure in the extension of the gas-works was under consideration.

Alderman HUGH BELL, in moving the requisite resolution, said he should have been content to have moved it in a merely formal manner, had it not been for the recent experience he had had of the result of taking things for granted. He regretted the fact that on the 2nd inst., at the statutory meeting of ratepayers, where he had made a short statement, sufficient as he thought for the purpose, the motion was declared to be lost. It caused him some surprise and some distress, as the result was to inflict upon the town a very heavy expenditure. He had no fear but that his colleagues would vote in favour of the promotion of the Bill that day; but after the experience referred to, he would make a longer statement than might otherwise have been necessary. It was in 1891 that the question was raised respecting the further extension of the gas-works; and the application then decided upon was granted under the Bill of 1892, under which considerable expenditure had taken place, but not sufficient to keep pace with the growing wants of the town. Two years ago, he had again to draw attention to the critical condition at the gas-works, and to the necessity of pressing on the consideration of the plans they had in hand. This urgent advice was repeated in June last year, when he dwelt upon the future prospects of the undertaking. A variety of circumstances prevented the carrying out of their intentions as expeditiously as ought to have been the case; and the Council knew that the winter of 1896-7 proved one of unexampled distress for the works, because of the heavy demand made upon them, bringing home to him most forcibly the necessity for contemplating a further large expenditure of money at an early date. They had now put themselves in the way to meet this demand. The Council would recollect that the Committee had recommended the adoption of a water-gas plant. This was erected; and it would no doubt prove of use to the town in the forthcoming season, as it already had been of service in making a great improvement in the quality of the gas during the last few months. But the erection of the plant absorbed the whole of the balance of money they had power to raise; and it became necessary to consider what steps should be taken for the future. Accordingly, in July the Committee instructed Mr. Corbet Woodall, in conjunction with their Engineer (Mr. Terrace), to prepare a report as to their requirements. The report had been in the hands of the Committee only, and had not, for obvious reasons, been published; but it practically confirmed the opinion at which the Council arrived in 1892—that they could, with proper care, make the existing works serve the town for some time to come. From his own estimate, probably thirty years would elapse before it would be necessary to consider the erection of further works in the town. They were making application to Parliament for powers to spend a considerable amount of money; but he was at one in the opinion entertained by the Engineers that they were right in going on with their extensions in Commercial Street, and with the Council in their complete unanimity of opinion to fill up the property there. The object of the Committee was, therefore, to secure all the land in Commercial Street that would enable them to meet the requirements of the town. As the result of negotiations, they had secured a site near the ferry at a cost of 27s. 6d. per yard. There was also a small piece of land jutting on to the gas-works which took away a most important corner; and the Committee had that day approved of a contract by which they acquired this land (between 300 and 600 yards) at a cost of £500, and granting to the present owners certain rights of railway facilities over it. They had also found it necessary to purchase a small piece of land, with some cottages, for £4800. It was a large sum of money; but it was the lowest price they could buy at. It was proposed to get authority to erect carburetted water-gas plant on this land, though it was open to question whether they had not already the power to do so. But, on the advice of their lawyers, they had thought it best to make specific application for such powers in the proposed Bill. They also sought power to supply water gas wholly or in part; so that it would rest with the Council to place any limitation they chose on the proportions of gases to be supplied. The Bill further provided for funds for a variety of structural alterations to the works; the desire of the Committee being to replace the old retorts with others which could be worked easier and cheaper. They also sought power to extend the mains—a matter that was always claiming the consideration of the Committee. He hoped the various new powers would enable them to light the town for ten or fifteen years longer. In order to do these things, they would require a capital of £150,000. A great commercial undertaking of this kind could not be carried on without capital expenditure to maintain the works, and to meet the increased requirements. They had in the past lost sight of the present necessities of the growing town; but this only made it more essential that the powers sought should not be delayed. He could not undertake the responsibilities incumbent upon the Chairman of the Committee if the additional powers were not secured before next winter; and he hoped the Council would proceed with the Bill even if the poll should be against them. He had no doubt that their representation of the circumstances, and of the urgency of the matter, would carry the Bill through. Referring to Mr. Mosses, who appeared to him to lead the opposition at the public meeting, he (Alderman Bell) understood from the Town Clerk that this gentleman had intimated his regret that it was impossible to retrace the steps taken on that occasion. Replying to questions, Alderman Bell added that the total capital expenditure on the gas-works was £225,600, and that the available amount of profit last year was £15,159, which was about 7 per cent. on the expenditure. They had redeemed about a fourth of the capital; leaving it at £171,571. It was not intended to use all the money for which borrowing powers were sought. But they had a revenue of £15,159 towards redemption; and on purely commercial grounds, they could challenge comparison with any other town in the kingdom.

The motion was unanimously carried.

THE HULL CORPORATION AND THE KINGSTON-UPON-HULL GAS-WORKS.

The Purchase Sanctioned by the Local Government Board.

Notification was received at Hull last Tuesday that the Local Government Board had given formal sanction to the purchase of the Kingston-upon-Hull Gas-Works by the Corporation for the sum of £92,500. This is the oldest of the three Companies supplying Hull with gas; and the works are situated in the heart of the town, and occupy a site which is required for important street improvements. The works will be dismantled; and the Corporation will arrange to be furnished with gas by one of the other Companies. It is stated in one quarter that they have already arranged to be supplied by the Sutton, Southcoates, and Drypool Company, at 1s. 6d. per 1000 cubic feet. The Kingston Company are charging their consumers 3s.; and the Corporation will serve them at 2s. 4d.—thus reducing the price by 8d., and making a profit to enable them to pay off the cost of the purchase in a series of years. The transaction has met with the general approval of the ratepayers.

PREPAYMENT GAS-METERS IN ENGLAND AND THE UNITED STATES.

A short time ago, reference was made in the "Engineering Record" to prepayment gas-meters; and it was thought by some of the readers to have conveyed the impression that these meters are almost unknown in America.

A correspondent who is a member of the gas engineering profession has pointed out that this is far from being the case—there being already more than 40,000 in use; and no progressive gas company have, he says, failed to study the subject and experiment with the meter. Referring to the English practice in connection with the supply of gas on the prepayment system, he points out that a charge of £6 a house is incurred in fitting it up for the coin-meter service; and that, in order to reimburse themselves for this outlay, they make an extra charge of 10d. per 1000 cubic feet for the gas. Such an arrangement was necessary, as no company could afford to make an additional investment of £6 for a consumer paying only £3 a year unless there were some method of recouping the outlay other than the ordinary profit on the sale of the gas. But the writer goes on to say: "Imagine, if you can, the effect of such a policy in this country. What a whirlwind of vituperation would flow from the demagogues and other lovers (for revenue only) of the dear people! They would want nothing better than the opportunity to advertise themselves by flaying alive the blood-sucking vampire that wants the poor working man to pay for the special privilege which he enjoys. Even now the law compels the gas companies to charge the same per 1000 cubic feet for gas burned at the rate of 4 or 5 million cubic feet per annum as is charged when it is burnt at the rate of 400 or 500 cubic feet a year. It is needless to say that much comfort, convenience, and economy is lost by the class who would use these appliances if installed upon the same terms as in London; but that is a small matter so long as the 'bloated monopolist' makes nothing by the transaction. . . . As gas bills in America are payable monthly, instead of quarterly as in England, the only advantage in the prepayment meter here is that it enables the consumer to burn gas who is too improvident to save money to pay for it at the end of the month, and enables the gas company to have as consumers people who are not sufficiently honest to pay their bills, and cannot raise the cash to make a deposit to guarantee payment."

Lighting by Acetylene Gas in Rural Districts.—Acetylene gas has lately been satisfactorily installed in five places within a short distance of the north-west boundary of Newcastle. They comprise two mansions, a colliery, an inn, and a tradesman's shop.

Projected Extension of the Ripon Gas-Works.—Last Thursday a special meeting of the Ripon City Council was held—the Mayor (Mr. J. B. Lee) presiding—to consider recommendations of the Gas Committee that a Provisional Order should be applied for to obtain borrowing powers for £8500 for extending and improving the works. From the statement of the proceedings of the Committee, read by the Town Clerk (Mr. M. Kirkley) it appeared that the sum included the erection of a gasholder, the laying of mains, the provision of purifiers and condensers, the alteration of the retorts to the regenerative system, and other work. It was also suggested that power should be obtained to defer for thirty years the payment of the balance (£4750) of the old loan of £18,000, which would be outstanding in 1900. The Gas Manager (Mr. E. E. J. Anderson) reported that the carbonizing plant at the works was in poor condition, and that if the regenerative system were adopted there would be a saving of 20 to 25 per cent. in gas, with a consumption of one-third less fuel. It was estimated that the new plant and mains would effect a saving of £1100 to £1200 per annum. There was a rapid increase in the consumption of gas. In the discussion which followed, the prospect of the introduction of the electric light was alluded to; and the Town Clerk pointed out that no company could introduce the light without a Provisional Order, which the Council could oppose. They might apply for such an Order themselves. The Mayor said the matter had been gone into, and it was found that the cost of the electric light would be double the present price of gas in Ripon; and with the improved plant they hoped to be able to reduce the charges for gas. After some further discussion, the proposal was adopted without a dissentient.

ELECTRIC LIGHTING NOTES.

By twelve votes to five, the Bury St. Edmunds Town Council last Tuesday sanctioned an application to the Local Government Board for permission to borrow £20,000 for electric lighting works.

A report from Constantinople has reached the "Financial News," to the effect that a Syndicate of financiers are applying for the concession to supply Smyrna with electric light, and have already handed in their project to the Ottoman Government. According to their proposals, the town is to receive 10 per cent. of the income and the free lighting of all the public buildings. They are willing to increase the number of street-lamps, and to reduce the cost of lighting to half the present expenditure for gas.

Further progress in the preliminary arrangements for the acquisition by the Leeds Corporation of the undertaking of the Yorkshire House-to-House Electricity Company was reported at the meeting of the Parliamentary Committee last Thursday, under the presidency of Mr. C. H. Wilson. A resolution has already been adopted recommending an application to the Local Government Board for a Provisional Order to enable the Corporation to issue 5 per cent. debenture stock with a view to the purchase of the undertaking; and the Town Clerk stated at the meeting that all the necessary steps had been taken to give effect to the decision.

A special meeting of the Sheffield City Council is to be held to-morrow to consider the deadlock in the negotiations for the purchase of the undertaking of the Electric Light Company which was created by the recent decision of Mr. Justice North (*ante*, p. 1294). A recommendation will be submitted by the Parliamentary Committee that application be made to the Local Government Board for a Provisional Order amending so much of the Local Government Board's Provisional Orders Confirmation (No. 9) Act, 1892, as will enable the Corporation to issue irredeemable stock to an amount sufficient to raise the purchase-money required for the purchase of the undertaking.

The Bristol Town Council last Tuesday adopted a recommendation of the Electrical Committee that £23,000 be borrowed for the purpose of extending the street lighting by the erection of 200 arc lamps. Answering an inquiry by Alderman Dix, Mr. Pearson stated that about £100,000 was originally borrowed for electric lighting; and this was all spent. Then the Committee obtained a vote for £75,000 for the purposes of private lighting; but the whole of this sum had not been expended. The £23,000 now asked for was entirely for public lighting. By the end of next year, the £75,000 would probably be expended; and the station would be equal to 80,000 lamps.

Norwich has had an explosion in an electric lighting culvert; and a local reporter says it created "considerable alarm" among the residents in the neighbourhood. This agitating event happened last Tuesday week shortly after two o'clock. A report was heard; and, on making investigations, it was found that four of the manholes to the electric lighting culverts underneath the pavement opposite St. Andrew's Hall had been considerably disturbed. At first, the reporter says, the supposition was that a freak of the electric current was the cause of the mischief; but there was an unmistakable smell of gas in the air. This is quite likely, as sewerage operations have lately been going on in the street; and it is not an unknown thing for excavations of this kind to result in gas escapes. However, the force of the explosion was such that the covering of one of the manholes, which weighed close upon a hundredweight, was shifted 5 feet from its bed, and landed in the middle of the road; while for several yards round the scene of the explosion, the paving-stones felt the effect of the shock.

Some confusion and a great deal of unpleasantness were caused last Friday evening in the central district of London, owing to an accident at the works of the Metropolitan Electricity Supply Company in Sardinia Street, Lincoln's Inn Fields, resulting, it was stated, from a fire in the dynamo-room. How the conflagration originated was not explained; but the direct result was to plunge Holborn, and a considerable district relying upon the service of the Company, into temporary darkness. The supply appears to have failed shortly after six o'clock; and in some places it was not until seven o'clock, or even later, that the gas-lamps were lighted, and business could be resumed. During the interval, Holborn presented a very dismal appearance indeed. The affected area lay chiefly between the Holborn Viaduct and Tottenham Court Road; but the important arteries between these two points were again lighted by nine o'clock, and before half-past ten most of the chief customers of the Company were being supplied as usual. Several theatres and music halls were deprived of light—notably the Empire and the Royal. But, fortunately for the proprietors, gas was available, and it was quickly brought into use. "The incident," as remarked by one of our daily contemporaries, "served to illustrate the fallibility of the latest resources of science as regards illumination by electricity, and the necessity, in a city like London, of an effective gas reserve."

At the outset of their career, the Electric Lighting Committee of the Plymouth Corporation have been met with the difficulty that their estimates are on too low a scale. The contracts for the machinery were let a few months ago; and at a recent meeting the Committee had under consideration tenders for the erection of the buildings. The lowest was found to be largely in excess of the sum included in the loan for the purpose; and the Chairman of the Committee, the Borough Surveyor, and the Electrical Engineer were requested to "endeavour to devise a scheme which would materially reduce the cost of the works." The result was reported to the Town Council yesterday week. Mr. Debnam, the Chairman of the Committee, said that by the elimination from the plans and specifications of what was merely ornamental, a saving of £3000 could be effected. In most cases they had paid the highest price estimated for the machinery; and in this way the "contingency" item of nearly £5000 was wiped out. The only thing, therefore, left for the Committee to do was to cut down the specifications for the buildings. Some members of the Council were anxious for further information; but Mr. Debnam declined to state the amount of the lowest tender. It is, however, pointed out in a local paper that the "merely ornamental" must have been a pretty heavy item in the cost of the buildings, the original estimate for which, including wharves and other conveniences not included in the present plan, was £7500.

THE METROPOLITAN WATER SUPPLY COMMISSION.

Third Day—Monday, Dec. 13.

(*Viscount* Llandaff, *Chairman*, *Sir* John E. Dorington, Bart., M.P., *Sir* G. B. Bruce, M.Inst.C.E., *Major-General* A. de Courcy Scott, R.E., *the Right Hon.* J. W. Mellor, Q.C., M.P., *Mr.* A. de Bock Porter, C.B., *Mr.* H. W. Cripps, Q.C., and *Mr.* R. Lewis.)

The Commissioners sat, as on previous occasions, in the Moses Room of the House of Lords.

The following are the Counsel engaged: Mr. Pope, Q.C., and Mr. Claude Baggallay, Q.C., for the New River Company; Mr. Littler, Q.C., and Mr. Lewis Coward for the Kent Water Company; Mr. Pember, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. Rickards for the Chelsea Water Company; Lord R. Cecil for the Hertfordshire County Council; Mr. Balfour Browne, Q.C., and Mr. Freeman, Q.C., for the London County Council; Sir R. Nicholson for the Middlesex County Council; and Mr. Gabriel P. Goldney (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by Messrs. Bircham and Co.

On the resumption of the inquiry,

The Chairman: I have still a few questions to ask you, Mr. Cripps, on the subject of control. I gather that you, as representing the County Council, object to the policy of control as opposed to purchase?

Witness: I do not think I have stated that. The view of the London County Council upon the matter has been that the course which they adopted in introducing their Bills of 1895 and 1897 was most in accordance with the decisions of Parliament and the recommendations of Committees—most in accordance with practice, and most likely to prove feasible. They had to consider, not what was most theoretically advantageous or expedient for the London ratepayer, but what was practical; and though they introduced their Bills, there has never yet been submitted or suggested to the Council or the Commission, any scheme of control, in the sense of not being purchase, which appeared to them to be feasible or requiring to be considered. If any such scheme were considered of a definite and practical character, it would receive most careful consideration by the County Council.

Then I may take it that the London County Council are not adverse to any practical and efficient system of control, as opposed to purchase?—My difficulty in answering the question is that until there is some definition of "control," I hardly know how to deal with the matter. Continuing, witness referred in detail to the suggestions made by Parliamentary Committees or in Bills regarding control. Sir George Grey's Bill of 1851 provided for control on the basis of dissolving all the nine Companies and forming one, in the capital stock of which they should all be apportioned a share. This was a very important Bill, as showing what was then proposed in the way of control, using that term otherwise than in the sense of purchase and ownership by a local authority. In 1852, two Bills were before the House - one introduced by the Government, and the second by Sir B. Hall and others. The latter provided for the appointment of a representative body, and for the transfer of the undertakings of all the Companies to this body. That was control in the sense of acquisition and ownership by a representative body. The Government Bill proposed control as apart from ownership. Then paragraphs 262 and 263 of the report of the Duke of Richmond's Committee contained important references to control—viz., that the constant service system ought to be introduced to the fullest possible extent in the supply of the Metropolis; that it could not be introduced effectually and so long as the supply remained in the hands of the local Companies; that it was a matter of vital importance that an abundant supply should be introduced for all classes of the population, as well as for general domestic purposes; that for this purpose there should be a power of levying two rates, one a special or domestic rate on all dwelling-houses, and the other a public or general rate on all rateable property; and that no trading Company should have control of the supply, but that it should be in the hands of a responsible public body with powers for purchase and extension of existing works, &c. Then came the Bill of 1871, which proposed to repeal the constant supply clause of the 1852 Act (which had proved to be ineffective), but bound the Companies to provide a constant supply in another way. It was thought that the Companies should be put under proper obligations and restrictions; and that, if they did not like to comply, there should be powers of purchase. The Bill gave power to the Metropolitan Board to purchase any one of the Companies' undertakings, without the necessity of buying the others. This Bill was opposed so strenuously that it was withdrawn, and another satisfactory to the Water Companies was introduced and passed. This did not repeat any of the purchase clauses; but the others, with modifications, were embodied in it. The next document referred to was the report of the Select Committee of the House of Commons on the Metropolitan Fire Brigade, of 1877, in which the Committee expressed the opinion that the water supply could not be made to afford the full measure of protection which the Metropolis should possess against fire until it was consolidated in the hands of a single authority, conducting the business not for immediate profit but for public convenience. Then followed Sir William Harcourt's Committee, who suggested legislation on the lines of the gas companies. The recommendations of the Committee were summed up in the paragraph which said it would be possible to proceed by regulation.

Do you see any difficulty in a clause which should enlarge the dividend of the Company in inverse ratio to the price at which they supplied their water?—I am not prepared to suggest how it could be done; but I need not point out the obvious differences between the supply of water and that of gas. If people are not satisfied with the gas, or the price of it, they can have other illuminants; but if their water supply is cut off, they cannot go round the corner, and get water from somebody else. That is really the difficulty of applying to water supply legislation which might be suitable in the case of gas.

If water was supplied by meter, would there by any difficulty in framing a clause enacting that if the Companies sold their water in this way, below a certain standard price, they should be allowed to increase their dividends?—I do not think you would ever get the governing bodies of London to support a general supply of water by meter. If you assume

the possibility of measuring the water supplied to each consumer as being practicable, I daresay something of the kind could be formulated.

Do you think you could take a certain standard scale of supply, and enact that if the Company charged below that standard, their dividend might be increased?—I think I could draft a Bill on those lines; but as to the policy, I am rather doubtful of it. Witness added that to a large extent the settlement in the case of the London Gas Companies had been regarded with great doubt; for while it had lowered the price of gas to the consumer, it had also given the Companies an enormous profit. Many people felt that such a large profit should not be made out of the public without further concessions. It was rather a question of profits than of the standard not having been fixed low enough. Having alluded to paragraph 6 of the report of Sir M. W. Ridley's Committee, witness turned to the Staines Reservoirs Scheme, and the regulations with regard to taking water from the Lea, which were dealt with by Lord Balfour's Committee in 1893. The sole authority over the Lea was the Lea Conservancy Board, on whom devolved the duty of saying how much water should be taken. But witness suggested that the Companies had obtained such influence over the Board that their present power should be restricted. Indeed, the County Council representative on the Board, said it was practically run by the Water Companies.

This statement caused some discussion among Counsel, who asserted that the representation of the two Companies—the New River and the East London—on the Board was far from preponderating; but witness maintained that the Board was worked too much in the interests of the Companies. The fault lay in the fact that it was insufficiently representative of the inhabitants of London generally, and of the East-end and West Ham in particular.

Witness, continuing his evidence, said control was discussed before Mr. Plunket's Committee in 1895; that Committee proceeding throughout on the assumption that the real question they had to determine was as to the terms of transfer. No decision, however, was given by that Committee. Then came Sir Joseph Pease's Committee, which was followed by Lord James's Bill of 1896, the provisions of which he explained. The Government proposed a representative Water Board, which should control the whole of the Metropolitan water area; and then under pressure, they consented to a clause by which the different counties were empowered to break away and become separate water authorities.

The CHAIRMAN: That is, the Government seem to have yielded to the same pressure as the London County Council?

Witness: They could not get their Bill without. Passing on, witness pointed out that under the recent Act, power was given to any water consumer, in addition to whatever other remedies might exist, to complain of the Water Companies to the Railway Commission. It would be interesting to observe what might happen in the case of these two concurrent jurisdictions apparently dealing with the same question.

Can you assist us by suggesting any additional powers of control of the Water Companies, which would be practicable and desirable?—I am here as representing the London County Council, and am authorized to speak on behalf of the Water Committee. The difficulty they have felt about this question is that what they are desirous of attaining is a final settlement of the whole of this water question; and, as at present advised, they do not see how a measure of the kind would attain this end. It must lack the element of finality; and therefore it is that no system of control, so far as they see at present, would meet the case. Witness intimated that the Committee would give any definite proposal their most serious consideration; but he was not authorized, and was unable, to make any practical suggestion which would assist in that direction.

By Mr. MELLOR: There was a good deal of rateable property in London which did not pay water-rates. The County Council had often had complaints, both as to the quality and quantity of the water; and the Medical Officers throughout London frequently condemned the samples they took. They could not, however, do much with these complaints. No one suggested that the water within the control of the Companies was too little for present needs; but the advice given the Council showed that it was necessary to make larger provision for the future than was contemplated even by the Companies themselves. If the Companies were purchased by arbitration on fair and reasonable terms, having regard to all the circumstances of the case, it would very soon be possible to make a reduction in the charges, if not immediately. One saving no doubt would be effected in the collection of the water-rates, which at present was very expensive. Then the ratepayer who had a grievance would be able to get it remedied more easily by appealing to his representative. The mode of charge by the Companies, he thought, was the same in all cases. The extra charge for high service, baths, and water closets, he believed, was universal, subject to this: That the rateable value of the houses in respect of which the Companies have power to charge for water-closets was not the same.

Major-General DE COURCY SCOTT: I understood you to say that the County Council have no power to deal with complaints by consumers without bringing in a Bill. But under the Act passed last session have not the County Council power to act?

Witness: Yes; they have. In fact, the County Council are considering what to do under the Act.

By Mr. DE BOCK PORTER: His contention was that the maximum rates formerly allowed in the Companies Bills were intended only as an indication of what they could charge, not what they would very generally charge. The Lambeth Company still charged the maximum rates over a large area of supply. He held that the interests of the ratepayers and shareholders in the matter of water were necessarily antagonistic. He could suggest no other form of control, save in the sense of ownership.

By Mr. H. W. CRIPPS: The recommendations of the Committee of 1869 had been quoted, and he believed invariably acted upon by Committees of Parliament since. The regulation of the Gas Companies by the Act of 1876 had been a great success to the Companies. If it had been possible, it was obvious that similar means of regulating the Water Companies would have been adopted long ago. The enormous profits of the Gas Companies had largely arisen from the extensive utilization of their residual products.

Mr. H. W. CRIPPS: That is one of the differences. Gas is a manufacture; water is an element.

Witness: The difference is so considerable that it puts water and gas absolutely apart. Replying to further questions, witness did not see how it was possible for anyone to offer an independent water supply to the Metropolis, unless coupled with a scheme for purchasing the Companies. He wished he could, because nothing probably would be so advantageous to the ratepayers. At the same time, he admitted that such a scheme would be very hard on the Companies. All difficulties would be got rid of by purchasing the undertakings. Sir William Harcourt's Committee in 1891 recommended that the London County Council, if constituted the Water Authority, should be required to purchase the whole of the Companies, with certain minor exceptions; but there was no distinct discussion of this clause before the Committee. It had been suggested that purchase might be made of one or more Companies; but objection was taken that a system of this kind could scarcely be charged on the rates, and that if it were some kind of apportionment of the rates would have to be made. This might have led to the suggestion that the County Council should purchase all the eight Companies. There ought to be no material difficulty in arriving at an agreement for purchase between the London County Council and some of the Water Companies at the present moment, but for the circumstance that the Companies were all in alliance, and would not treat individually. With some there was not the remotest possibility, except by arbitration, of an agreement being arrived at which would be satisfactory to the people of London. If the agreements which Mr. Smith had made with the Companies had been carried out, London in the present year would have had to pay probably a 2d. rate in addition to the water-rates. Witness was then taken at considerable length into the proceedings before Lord Rathmore's Committee of 1895, where, he said, the whole question considered was not the purchase of the Companies, but the terms of their purchase. The whole time of the Committee would have been thrown away, save on the assumption that they were going to pass the preamble of the Bill they were considering. The main question was whether it should be put in as a direction to the Arbitrator that he should not consider the question as one of compulsory purchase; but there was more than that. It was the suggestion of the County Council that, instead of a number of incidental questions being dealt with first of all, and that there should then be the purchase, the arbitration tribunal should have regard to all these things. Regarding the arbitration clause, he agreed that the first part was not consistent with the latter. The real difference between the Council and the Companies was the matter of arbitration; on that they could not agree.

Witness's examination having been concluded, the Chairman inquired of Counsel whether they wished to cross-examine him. Some conversation passed, as a result of which it was understood that Counsel would, with the object of saving time, postpone their questions till after the other evidence from the County Council had been submitted.

The Commission then adjourned till Jan. 17.

SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly General Meeting of this Company was held, last Tuesday, at the Offices, Southwark Bridge Road—Alderman Sir H. E. KNIGHT in the chair.

The SECRETARY (Mr. Montague Watts) read the notice calling the meeting; and the report of the Directors was taken as read.

The CHAIRMAN said the attention given by the Directors to the Company's affairs had been unabated during the past six months; and at the present time, they were still in that condition when it was absolutely necessary to give more than ordinary attention to them, in order that they might conserve their property. They had now told the proprietors systematically for some years that during the six months which they might be reviewing, every requisite repair had been made to their plant, in order to enable them to perform the duties required. This statement had been made with perfect sincerity, and with the utmost truth. In alluding to the repairs, they referred to those parts of the machinery and plant which wore out, and which therefore wanted repairing; but they obviously did not mean those additions which came under the head of capital charges, and which were extra plant. Nor could they possibly refer to the repairs which might become evident after the date at which they were speaking. They spoke simply of what had come to the surface in the half year with which they might be dealing. This led him to a little something that had occurred with reference to their 42-inch main, which was laid some four years ago for the purpose of enabling them to bring a sufficient quantity of water into their district. This main had had a good deal of attention called to it during the past twelve months, especially from the statements which were made in evidence before the Parliamentary Committee last year. These statements he did not hesitate to say were for the most part exaggerations of the wildest character. He had, in conjunction with his colleagues on the Board, given special attention to this important question, because he had been determined that the shareholders should be taken thoroughly into their confidence in the matter. He had therefore asked the Engineer to give him a report on this main; and he would read it to the meeting. He said: "The length of the main is about 16 miles; it passes under the river twice, and under various railways in six places. The position of the main at these points necessitated the pipes being placed on concrete; and although exposed to considerable vibration, not a single leakage has occurred. From first to last no trouble has occurred with the pipes themselves; and the only instances since it was laid have been one bend, which was a faulty casting, and one split pipe, caused by the shutting of an air-valve." Now, this state of things in a length of 16 miles must, he thought, bring to their minds the fact that the greatest possible care was exercised, as far as supervision was concerned, in laying the main. "The ordinary sockets would have been about 4½ inches deep, of which 2½ inches would have been lead, and the remainder composed of strands of white yarn, which is perishable, and often causes considerable trouble after the main has been completed. In the present instance, it was very desirable to avoid this; and the sockets were made 3 inches in depth. But the whole of this depth was run solid with lead throughout. The joint, although shallower, is actually much stronger than the old-fashioned type as, instead of the water-resisting material—viz., the lead—being 2½ inches thick, it exceeds 3 inches." On the point of this socket, a most extraordinary rumour had reached him—that there was some patent about the new joint, and that someone was interested in it who had no business to be. This was an entire mistake. There was no

patent in the socket or in the joint; and no one was personally interested in it. He hoped that with this explanation anyone who had heard the rumour would consider the matter at rest. The report continued: "There have only been one or two instances in which mains of this diameter have been laid, and in no instance a pumping-main. But in these cases—such as the leading aqueducts supplying Manchester and Liverpool—a similar type of joint has been used with success; and it is only the treacherous nature of the ground in places that has caused trouble with the main in question, as although its construction is identical throughout, isolated lengths have leaked, while adjoining pipes have from the beginning been perfectly satisfactory. Even where leakage has occurred, the quantity has been altogether inconsiderable—in the great majority of cases not amounting to more than a man could bale out with a ladle, so that the actual loss of water is infinitesimal." This was very important, because it was stated before the Parliamentary Committee that the waste was immense—that they lost half the water that passed through the main, and that the main was not wanted at all if only proper precautions had been used. "The original cost of laying this main was very much less than the usual cost of similar works; the price in some cases being as much as 50 per cent. above the cost of the main in question. It is anticipated that the additions to this main will be completed by next March, and that the total cost of the main thus strengthened and improved will be found to compare favourably with that of any similar main in the kingdom." He had been glad to be able to read this report, which had been substantiated by his own observation. He knew perfectly well that these leakages had occurred in consequence of some five or six miles of the main passing through strata of treacherous running sand. Since they obtained their Act of Parliament, they had opened a great number of joints along the road where the leakages were found. They had exposed as many as 487 joints, out of which they found that 115 were what engineers called "weeping"—they were joints that were not leaking, but which, owing to the nature of the ground, showed that some additional strength wanted to be given to them. The additional work had been done. He thought these facts would set their minds at complete rest with reference to this main. They were now going on with it through Kingston; and they hoped to get it completed by March next. Messrs. John Aird and Son, who laid the main, thought the joint used was an excellent one. Nevertheless, in their Act of Parliament last year, a duty was put upon them to see to the main and the road, in consequence of complaints which had been made by the Local Authorities. This, however, had not made their position any worse than it was before. They were bound before, if their main wanted additional strength, to see to it; and they were also obliged to repair the roads in a satisfactory manner. Parliament had simply said that they were to do what previously they knew they would have to do. Passing to the report, he stated that the increase in the number of their supplies was perfectly satisfactory. He thought he could show that they had every reason to congratulate themselves upon the progress they were making, and on the high position in which they stood. They had a Bill in Parliament last year, which they were successful in piloting through. That was the seventh Bill they had introduced into Parliament under his chairmanship during the past sixteen or seventeen years; and all but one passed. The Bill of last session became necessary in consequence of the decision of the High Court as to the quantity of water they were to take from the Thames. He stated at their Wharncliffe meeting, that the Bill contained a clause to the effect that they should this year bring in a permanent Bill for the consideration of Parliament, so that everyone who desired to be heard on it might be heard. This Bill they had now prepared; and it had been duly lodged. He should not detain them now by further alluding to it, as they must call a Wharncliffe meeting to submit it to their consideration; and it would then be for him to explain the matter fully. He would only say that, although it was a matter of such urgent necessity, they were virulently opposed, and by no one so virulently as by the London County Council, who would have done anything they could to defeat the Bill, so that the Company might not have water with which to supply their customers. The County Council did not care in the least what happened, so long as they could damage the Water Companies, and buy them up cheaply. An Act of Parliament was passed last year called the Metropolis Water Act, 1897, which was supposed to institute a stronger system of control over the doings of the Water Companies. This Act enabled a consumer to go to the Railway and Canal Commission, and ask them to hear and determine a complaint. This was in addition to the power which the consumer had of bringing them before a Court of Summary Jurisdiction. The Act also did another and very dangerous thing—it gave power to a Local Authority to take up a consumer's complaint, fight an action for him, and pay his expenses. That in itself, he thought, was not altogether a proper condition to place a Water Company in. But how had it worked? The County Council—he presumed, acting under what they thought was the authority given them—sent emissaries throughout the whole of their district and that of the Lambeth Company, and, for aught he knew, the districts of the other Companies as well. These emissaries went to the consumers and asked them to show the statement of charges sent in; and they tried, if they could, to point out some defect or fault in the account, so that they might rake up difficulties between the Company and their customers. He did not believe that Parliament ever intended this; and he was thankful to say that, in his long public experience, the London County Council were the first public Authority that had ever attempted anything of the sort. However, thanks to the straightforward and clear manner in which their accounts were rendered, they had not had one single customer make a complaint to them; but, on the other hand, they had had consumers complaining to them of what they called the improper action of the County Council. A Royal Commission had been appointed; and, he did not know that either the proprietors or the public generally were fully alive to what was referred to this Commission. They were not to inquire into the quality or the quantity of the water supplied to London, or the way in which the available water at their hands could be made useful. This was all settled by Lord Balfour's Commission; and the present Royal Commission had said that they would not go behind it—and very properly so, because there never was a Commission that did its work more ably. The recommendations of the Commission had been accepted by the Water Companies; and they were all carrying them out to the fullest extent—certainly as regarded storage, which was the principal recommendation of Lord Balfour's Commission. What was referred to the present Commission was to consider whether it was advisable to buy up the undertakings of the Companies; and, if so, whether they should be purchased by one Authority or by several. Another thing referred to them was whether the Water Companies, if they were not bought up, should be subjected to further control; and, if so, what control. A further question was whether it was practicable to connect all the water undertakings; and, if so, how it was to be done, and how paid for. The Companies would not urge the smallest difficulty as to this point. They had submitted a very simple plan for connecting all the Companies throughout London. They were in favour of it, and it might be a useful proceeding; but so far as he was concerned, he did not think it would ever be wanted. Still, if it satisfied the public mind, and did not cost too much, it would be a proper thing to do. As regarded the Commission generally, they had given, and would continue to give, all the information and assistance in their power; and they would do this because the Directors knew that the more the Commission and the public were made aware of the services rendered by the Water Companies of London, the more they would learn to appreciate them. By their Act of 1894, very large powers were conferred on the Company for constructing storage reservoirs, new engines, filter-beds, and service reservoirs, so that they might have more filtered water stored in their district. These matters had been energetically proceeded with as far as had been possible, considering the many difficulties thrown in their way by the County Council and other Authorities. All the works sanctioned by the Act were either completed or in progress. They had issued within the past half year another £100,000 of the debenture stock which was authorized by the Company's Act of 1894. It was 3 per cent. stock, redeemable at par after 25 years; but they nevertheless obtained for it a premium of £4 10s. on the £100. He thought that this was a fair matter for congratulation, as showing the high estimation in which their securities were held by the public. In regard to the question of their dividend, he intended dealing with it rather differently than he had done on previous occasions, and to indicate the reasons why they did not pay as large a dividend as the other Water Companies. This had been said to be the result of bad management; and it had been remarked also that the Board required looking after, and hunting up with regard to the matter. He believed he would be able to convince them that there was no mystery whatever in the fact of their not paying as large a dividend as the other Companies; and he thought he would be able to show them that their expenses were in every direction smaller than those of the other Companies. The population they supplied was 804,851—the largest number supplied by any of the Thames Companies; the smallest being that of the Chelsea Company who supplied 275,000. The number of houses supplied by their Company was 119,000—the largest number of the Thames Companies; the smallest being the Chelsea, who supplied 37,000 houses. The percentages authorized to be charged by their Acts of Parliament were as follows: The Southwark and Vauxhall Company, 5; the Lambeth Company, 5 to 7½ (so that the Southwark and Vauxhall was not the highest); and the Chelsea, Grand Junction, and West Middlesex Companies, 3 to 4. Those who looked at the shallow surface of things said: "Oh, some of the Companies are only allowed to charge 3 per cent. while you charge 5 per cent.; and yet they pay bigger dividends than you." Of course they did; and he would show them why. The gross annual income of the Southwark and Vauxhall Company was £244,000, the Lambeth Company only exceeding them; the latter's gross annual income being £257,000. That of the Chelsea Company was £153,000. These figures gave the Southwark and Vauxhall Company an income of £2 per house, the Lambeth Company £2 4s., and the Chelsea Company £4 12s. It was therefore not very surprising that the last-named Company should pay a better dividend than the Southwark and Vauxhall Company, in face of these figures. In regard to the subject of expenditure, this was a question which greatly interested them, because if their expenditure was unduly large it might be due to bad management. The expenditure of their Company was £117,000, and that of the Chelsea Company was £51,000. In other words, the Southwark and Vauxhall Company spent per house on management 19s. 7d.; the Grand Junction Company, £1 12s.; the Chelsea Company, £1 7s. 5d; the Lambeth Company, £1 0s. 2d.; and the West Middlesex Company, £1 6s. 5d. The expenditure of their Company per house was therefore the lowest of any. The net annual income of their Company was £126,000; while that of the Chelsea Company was £192,000. Therefore they received, after paying their expenses, £1 0s. 6d. per house, compared with nearly £2 15s. per house in the case of the Chelsea Company. Yet they were taunted because the Chelsea Company paid a better dividend than they did. Then as regarded the quantity of water supplied. The Southwark and Vauxhall Company delivered 33 million gallons of water per day to 119,000 houses; the Lambeth Company, 22 million gallons to 104,000 houses; and the Chelsea Company, 11 million gallons to 37,000 houses. Taking the figures per house, the Southwark and Vauxhall Company supplied 280 gallons per house per day; the Lambeth Company, 219 gallons; the West Middlesex Company, 256 gallons; the Grand Junction Company, 311 gallons; and the Chelsea Company, 316 gallons. Their Company was therefore in the middle. If they looked at the supply per head, the Southwark and Vauxhall Company supplied 40 gallons. The lowest supply per head was that of the West Middlesex Company—34 gallons; and the highest was that of the Grand Junction Company—48 gallons. Even in this comparison there was not much cause for complaint, because many circumstances had to be considered in connection with the usage of water. The Southwark and Vauxhall Company had a very poor district; and in poor houses the fittings were more neglected, the waste was greater, and the consumption was considerably more than in better houses. They therefore experienced considerable waste; while in their district, too, far more water was consumed for manufacturing purposes than in the districts of the West Middlesex, the Grand Junction, and the Chelsea Companies. They had also more houses on the constant system than the other Companies. In fact, nearly all the houses supplied by them were on the constant system; and statistics showed that, as they had extended this system, so their water supply had increased per head. Nevertheless, they were only in the middle as regarded the quantity supplied. They were not, however, satisfied with this; and within the

last six months they had taken steps to reduce if possible the consumption per head, and to stop leakages and waste where such cases had escaped their attention. The expenditure per house on capital account was as follows: Southwark and Vauxhall Company, £23; Lambeth Company, £17; West Middlesex Company, £19; Grand Junction Company, £28; and Chelsea Company, £33. In regard to this matter, it might be said that their Company had spent more, and that this was a reason why they could not pay a better dividend. But again they were in the middle as regarded capital expenditure per house. This expenditure, moreover, depended on the districts a good deal. They had to pump more water than the other Companies; and therefore they required more engines. They also had a large area to supply, for which they required more mains. Again they went through districts unlike those of the other Companies; the number of houses they supplied being fewer. All these points had to be considered, if they wanted to come to a fair and proper conclusion when they were judging of the way in which a company was managed. Then there was the question of legal expenses. They had to deal with 119,000 houses; and the legal expenses must naturally be more than with a Company having only 37,000 houses. They were in joint account with the other Companies, and paid *pro ratâ* on their capital the expenses incurred in connection with parliamentary opposition. Their capital was the largest of any of the Thames Companies; and thus their proportion of these expenses was considerably more. Naturally, therefore, their legal expenses might be expected to be higher; but let them see how they stood in this matter by comparison. During the past ten years their proportion of expenditure in defending their interests in Parliament against opposition, brought about mainly by attacks of the London County Council, had been no less than £10,500; and in this period things had occurred to them which no other Thames Company had had to meet. For instance, in 1896, when they endeavoured to get a Bill through Parliament, it was thrown out through the lateness of the session; but it cost them £4700. Their legal expenses, however, notwithstanding what he had said, had averaged in the past ten years £2500 per annum. He would take the year most nearly approaching this average—viz., the year 1894, when their expenses were £2529. This amounted to £2 3s. 9½d. per 100 houses, including all the extraneous expenses he had indicated. The similar expenditure of the Chelsea Company was only 11s. 7¾d. But that of the Lambeth Company was £2 5s. 7d.; of the West Middlesex Company, £2 12s. 3d.; and of the Grand Junction Company, £3 2s. Could it, therefore, be said their legal expenses were extravagant in comparison with those of the other Companies? These figures amounted to 4s. 9½d. per million gallons in the case of their Company, against 5s. 10d. for the West Middlesex Company, 5s. 8½d. for the Lambeth Company, 5s. 5d. for the Grand Junction Company, and 1s. 1d. for the Chelsea Company. He had therefore tested their position with that of the other Companies in regard to the crucial points mentioned; and he thought he must have removed any doubt which might have been in their minds, and proved that, as regarded every possible point affecting the prosperity of the undertaking, they compared most favourably with any other Company. Turning to the balance-sheet, he stated that they had a balance to the credit of capital account of £36,835, which would be sufficient to carry them on for some time; and he did not know that they would want to make a further issue before the middle of next year. With regard to their revenue account, the total expenses during the past half year for maintenance had been £46,000, as against £50,000 for the corresponding period of the previous year—or an apparent decrease of £4112. But a year ago £5667 was brought into the account owing to the great frost; so that their maintenance charges were really higher in the past six months than in the September half of 1896 by £1555. This amount was made up of three items—maintenance and repair of mains, filtration, and rates and taxes—the latter an old sore, to which he had frequently called attention. They had £76,000 to carry to dividend and interest account, against £64,000 a year ago; and therefore they were better off than they were at the corresponding period of 1896 by £12,027. The management expenses had been £7000, against £10,500—or a saving of £3447; their law expenses in the past six months having been only £254, compared with £3800 in the September half of 1896. The difference between these two amounts went to increase the available balance to be carried to dividend and interest account; but this still left a most important amount to deal with. The major part of the increased amount carried to the dividend and interest account came from the increase in the rents, the improvement shown in which was over £10,000. He took this as the great test of the prosperity of a company. He thought, from what he had said, they would agree with him that the Company was managed most economically. Deducting from the amount to the credit of dividend and interest account the interest paid and accrued on the preference stock, a balance of £44,634 remained applicable to dividend, as compared with £33,258 at the corresponding period of 1896. This enabled them to carry forward the very considerable balance of £11,000, from which, however, £3000 had to be deducted—this sum, as shown in their balance-sheet, being carried to the suspense account, because the Government Auditor was not quite satisfied whether the expense of the additions made to their 42-inch main should be allocated to capital or revenue account. This left them £8000 to carry forward, which he did not think a bit too much; for they must be able to meet any increased expenditure, and maintain, and if possible increase, the dividend. He concluded by moving the adoption of the report and accounts.

Mr. C. M. Vialls seconded the motion.

Mr. E. S. Norris stated that he had been in conference with many of the shareholders for the last two or three months; and several of them had brought before him certain matters which they had a perfect right to discuss. One of them had asked him to inquire whether they could not have an investigation made as to the acquirement or purchase of lands by the Company; and another question which he had been asked to raise was as to some secret service money. He was not, however, going into this point on the present occasion. He complained of what he argued was a want of confidence shown in the proprietors by the Chairman at their last meeting, relative to the 42-inch main and its condition; and he also complained of a letter which he had received from the Chairman in reply to one he had addressed to the office on the subject. The statement he had made in a letter addressed by him to a periodical was substantially correct; and if the Chairman had not at their last meeting hoodwinked them——

The Chairman (intervening) asked the proprietors to protect him from such remarks; and Mr. Norris was called upon to withdraw the expression he had used.

Mr. Green: And also let him explain what he means by secret service money.

Mr. Norris said that he was repeating words that had been uttered outside; and he declined to withdraw them.

The Chairman thereupon said, in that case, he should refuse to allow Mr. Norris to be heard further.

Dr. Chesshire said that Mr. Norris had not been dealing with the report of the Directors or the Chairman's speech; and other matters ought not to be discussed, unless the proprietors had received due notice that they would be brought forward.

A Shareholder remarked that an abominable charge had been made.

Mr. Norris replied he had made no charge; but if the meeting thought he had exceeded the bounds of what he ought to have said, he would act on the Chairman's ruling and withdraw. He afterwards proceeded to recognize the work of the Engineer in connection with the 42-inch main, and said he also regarded the Contractors (Messrs. Aird), as the best firm they could have employed. What he felt hurt about was that sufficient confidence had not been placed in the proprietors in regard to the main. In view of the rates the Company were permitted to charge the consumers, in comparison with those allowed to the New River, the Chelsea, the West Middlesex, and the Grand Junction Companies, he was at a loss to know why the Southwark and Vauxhall Company should not stand in as good a position as the other London Water Companies. He thought that they were in a very unfortunate condition; but he congratulated them on their 6 per cent. dividend. The cost of the little leakage to which the Chairman had referred would have to come out of the shareholders' pockets; and it would amount to from £25,000 to £30,000.

Dr. Chesshire said he did not know whether the speaker who had been addressing them was an emissary of the London County Council; but he was certainly doing the business of that body.

The Chairman, in reply, said that Mr. Norris had charged him with not having dealt with the matter of the 42-inch main at the last meeting as he ought to have done. He therefore read *in extenso* the reply which he made to Mr. Jeffries; and, proceeding, contended that he had put the whole matter before the meeting. Mr. Norris had got hold of a communication which had appeared in a certain periodical; and the Directors happened to know that that communication emanated from a source which they had materially punished for shameful opposition to their Bill of last year. What he had said in the House of Commons about the leakage in question was strictly true. Mr. Norris was a gentleman who some time ago sent a circular to the shareholders, asking to be a Director of the Company; but the Board had not thought it advisable to recommend him for election. He then read the letter, dated Oct. 20 last, which he had addressed to Mr. Norris, and said he considered that the circumstances of the case justified the reply he had made. Instead of believing what he (the Chairman) had told him, Mr. Norris preferred to trust to the periodical alluded to, and wrote to it the letter which had been mentioned. He asked the proprietors to remember that it was written at a time when the Water Companies were fighting against severe opposition, and with the greatest difficulties. If he (the Chairman) had entered into any newspaper war on the subject, it would have done the Company no good; and the matter had nothing to do with the public. He had to do with his partners, and no one else. They had nothing to do with Stock Exchange prices. All they had to do was to strive their utmost to pay as good a dividend as possible, to keep down expenses, and to maintain the Company in as prosperous a condition as they could; and he contended that they had done this. Mr. Norris wanted to make out that the expenditure on the 42-inch main was to come out of the proprietors' pockets. But additional plant was, and must be, a capital charge; and that would be the case with the collars put about the 42-inch main.

Mr. Norris said he differed from the Chairman in this matter, and so did others.

The Chairman (continuing), said he did not know what Mr. Norris meant by his reference to the purchase of land. The Company had bought no land excepting that which Parliament had sanctioned. He had also dared to insinuate about secret service money.

Mr. Norris said he had insinuated nothing.

The Chairman said it was all very well for Mr. Norris to try and shelter himself behind what people outside had said. Every charge that Mr. Norris had brought forward was utterly unfounded.

The motion was then put, and carried.

Other resolutions were afterwards passed declaring the dividends recommended, re-electing the retiring Directors and Auditor, and granting donations of twenty guineas and of five guineas towards the maintenance respectively of the Hampton Schools and the Hampton Hill Schools for the year 1898.

A vote of thanks to the Chairman, Directors, and officers terminated the meeting.

CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, Commercial Road, Pimlico, last Thursday—Sir W. H. Wyatt in the chair.

The Secretary (Mr. G. H. Gill) read the notice calling the meeting; and the report of the Directors was taken as read. He afterwards read the reports of the Government Auditor and of the Company's Auditors on the accounts. The latter announced their "great pleasure in again expressing their entire satisfaction with the clear and precise way in which the accounts have been kept—the more so taking into consideration the constant increase of work in the Accountant's department."

The Governor, in moving the adoption of the report, said he thought they had never been able to present to the proprietors quite so satisfactory an account as that submitted on the present occasion. It had required a good deal of care to produce this result, and much work on the part of the officers, to whom great credit was due. They had had a larger income, and still the expenses were no more; and he therefore

thought the state of their affairs was very satisfactory. The result of the accounts was that, after paying the full dividend at the rate of 10 per cent. per annum for the six months, and 5s. per cent. extra for the half year on account of previous dividends which had fallen short of the statutory yearly rate of 10 per cent. per annum, there would be a balance of profit of £3476, of which they suggested that the Directors should be allowed to transfer £2000 to the contingency fund. The expenses before the Royal Commission would be heavy; and they thought it would be wise to provide for them. The new main between Molesey and Surbiton was doing great service, and was sending all the water they wanted at present down by gravitation; thus saving a good deal of expense on pumping.

The Deputy-Governor (Mr. F. S. Clayton), in seconding the motion, said that he should like to take this opportunity, as the Governor had not mentioned it, of pointing out the nature of the precautions taken to verify the purity and excellence of the supply. The water was daily analyzed, both chemically and bacterially, by Sir William Crookes and Professor Dewar. In their report of September last, these gentlemen said: "There is no city in the world where such minute and incessant care is taken daily, and almost hourly, to detect and report on the slightest deviation from purity in its water supply." He thought this was a most important statement. Moreover, it was generally known that the Government also had the water of all the Metropolitan Companies analyzed by Sir Edward Frankland; and he took this opportunity of expressing their gratification at the honour which had been conferred by Her Majesty upon Sir Edward, in recognition of his services as Government Analyst. Sir Edward Frankland made his reports monthly in respect of the samples taken by him. With reference to the analyses of Sir William Crookes and Professor Dewar, these gentlemen were altogether independent of the Board. They took their own samples; and no notice was received by the Directors as to when they would be taken. He thought that the public ought to know that the Companies, as such, had nothing whatever to do with these analyses, excepting that they had to pay for them.

The Governor said he ought also to have added that, in view of the continued ability of the Company to pay the maximum statutory dividend, they proposed at Christmas next, as in previous years, to grant a bonus to those officers and servants who had been in their service not less than one year, and whose conduct had been entirely satisfactory.

The motion was then put, and carried unanimously.

Further resolutions were afterwards passed authorizing the payment of the dividends recommended; and a vote of thanks to the Chairman, Directors, and officers terminated the proceedings.

TORQUAY CORPORATION WATER SUPPLY.

Purchase of the Watershed.

The final stage has been reached of the long controversy over the Torquay watershed. By the Water Act of last session, the Corporation took power to purchase the land surrounding its Kennick and Tottiford reservoirs and the watershed of the adjoining Trenchford Valley, for obtaining a better supply of water and "protecting from pollution, contamination, fouling, or discoloration" the borough water supply. The Water Committee came to the conclusion that it was desirable to exercise this power and to acquire the land—in all about 2170 acres—and to abolish all habitations upon it. The proposal was submitted to the Ratepayers' Union, which three years ago was instrumental in wrecking a more modest scheme for the purchase of the watershed of the two reservoirs only. The Union was still of opinion that a less ambitious and less costly project would suffice to secure the protection of the water supply; but rather than involve the town in a renewal of the controversy which then took place, it decided not to oppose the Corporation scheme. The question came before the Town Council last Thursday, in the form of a recommendation by the Water Committee that the necessary notices should be given under the Act, and that when the land was acquired a belt 200 feet wide should be left all round the reservoirs as an additional protection; the future use of the remainder of the land being left open for further consideration. Mr. Beavis opposed the scheme, on the ground of its expense; and he moved as an amendment to the Committee's report that the advice of bacteriological experts of high standing should be obtained on the question of filtration. The two main points were the possibility of contamination so long as the watershed was either inhabited or cultivated, and the objectionable colour of the water at times owing to the peaty matter held in suspension. Expert opinion, he held, was in favour of dealing with such matters by means of filtration. Mr. J. F. Rockey said they had the advice of Mr. Hawksley, that all the habitations should be removed from the watershed, and the use of the land be restricted to pasturage. If necessary, they could filter afterwards; but as a first step they must buy the watershed. The amendment had the support of only its mover and seconder; and the motion was carried by 16 votes to 2. Further proceedings in connection with the matter are to be carried out by the Water Committee. The estimated cost of the land is no less than £43,000; while the scheme which the town rejected three years ago was estimated to cost only about £27,000.

Jubilee of the Wantage Gas-Works.—At the last monthly meeting of the Wantage District Council, Mr. Clement, in moving the adoption of the report of the Gas Committee, pointed out that this was the Jubilee year of the gas-works. They were started fifty years ago by private individuals, who carried them on till 1879, when they were purchased by the town for £3450. Since that time a similar sum had been spent in extensions and improvements; and the consumers were now having gas much cheaper than formerly. Mr. Clement pointed out that for about another fifteen years the town would have to find £408 a year towards the repayment of the principal and interest of the amount spent on the works; and he suggested that it would be wise to form a reserve fund out of the profits in case they might in the future have to compete with the electric light. This suggestion, however, did not meet with support; and consequently it fell to the ground. The report was then adopted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST

Referred to on p. 1337.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 14	10½	Alliance & Dublin 10 p. c.	24—25	+½	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	16⅞—17½	..	4 5 8
300,000	100	July 1	5	Australian 5 p. c. Db.	107—109	..	4 11 9
200,000	5	Nov. 11	6½	Bombay, Ltd.	6⅞—7¼	..	4 9 7
40,000	5	,,	6½	Do. New, £4 paid	5—5½	..	4 14 6
380,000	Stk.	Aug. 27	12	Brentford Consolidated	300—305	..	3 18 8
240,000	,,	,,	9	Do. New	227—232	..	3 17 7
50,000	,,	,,	5	Do. 5 p. c. Prf.	145—150	..	3 6 8
159,375	,,	Dec. 15	4	Do. 4 p. c. Db. Stk.	134—138*	+1	2 18 0
220,000	Stk.	Sep. 15	11½	Brighton & Hove Orig.	273—278	..	4 2 8
208,820	,,	,,	8½	Do. A. Ord. Stk.	200—205	..	4 2 11
933,500	Stk.	Aug. 27	5	Bristol, 5 p. c. max.	130—135	..	3 14 1
420,000	20	Sep. 30	11½	British	56½—57½	+½	3 18 3
50,000	10	Aug. 27	11½	Bromley, Ord. 10 p. c.	25—27	..	4 5 2
71,000	10	,,	8½	Do. 7 p. c.	20—22	..	3 17 3
500,000	10	Oct. 14	6	Buenos Ayres (New) Ltd	9½—10	—½	6 0 0
98,122	Stk.	—	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	July 15	8½	Cagliari, Ltd.	30—32	..	5 3 1
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	16½—17½	..	4 11 6
50,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	59—61	..	4 18 5
550,000	Stk.	Oct. 14	13⅜	Commercial Old Stock	340—345	..	3 18 3
196,483	,,	,,	10½	Do. New do.	255—26C	..	4 0 9
196,309	,,	Dec. 15	4½	Do. 4½ p. c. Db. dc.	154—157*	+1½	2 17 4
800,000	Stk.	Dec. 15	12	Continental Union, Ltd.	250—255*	−1	4 14 1
200,000	,,	,,	9	Do. 7 p. c. Prf.	213—218*	−½	4 2 7
51,600	Stk	Aug. 27	14	Croydon A 10 p. c.	315—320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	252—257	..	4 5 7
535,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	138—142	..	3 13 11
60,000	,,	,,	5	Do. 5 p. c. Prf.	140—143	..	3 9 11
486,090	10	July 29	11	European, Ltd.	26—27	..	4 1 6
354,060	10	,,	11	Do. £7 10s. paid	18½—19½	..	4 4 7
5,896,590	Stk.	Aug. 12	12¾	Gaslight & Coke, A, Ord.	313—316	..	4 0 8
100,000	,,	,,	4	Do. B, 4 p. c max.	113—118	..	3 7 10
665,000	,,	,,	10	Do. C, D, E, 10 p. c. Prf.	317—322	..	3 2 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150—155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	222—227	..	3 6 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	204—209	..	3 7 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	317—322	..	3 2 2
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	182—187	..	3 4 2
1,061,150	,,	Dec. 15	4	Do. 4 p. c. Db. Stk.	138—141*	+1	2 16 9
294,850	,,	,,	4½	Do. 4½ p. c. do.	155—158*	+1½	2 16 11
908,000	,,	,,	6	Do. 6 p. c. do.	205—210*	+1	2 17 1
70,000	10	Oct. 28	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	Nov. 11	10	Imperial Continental	220—225	+5	4 8 11
376,400	100	Aug. 3	4	Do. 4 p. c. Dbs. Red.	99—102	..	3 18 5
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk.	104—107	..	3 5 5
75,000	5	Dec. 15	6	Malta & Medn., Ltd.	5⅛—6*	+½	5 0 0
560,000	100	Oct. 1	5	Met. of Melbourne, 5 p. c. Db.	112—114	..	4 7 8
250,000	100	,,	4½	Met. of Melbourne, 4½ p. c. Db.	107—109	..	4 2 7
541,920	20	Nov. 11	5	Monte Video, Ltd.	14½—15½	..	6 9 0
150,000	5	Nov. 26	8	Oriental, Ltd.	8—8½	..	4 14 1
135,000	5	,,	8	Do. New, £4 10s. pd.	7—7½	..	4 16 0
15,000	5	,,	8	Do. do. 1879, £1 pd.	1—2*	..	4 0 0
60,000	5	Sep. 30	7	Ottoman, Ltd.	4½—5	..	7 0 0
420,000	100	Nov. 2	6	People's Gas of Chicago, 1st M. Bd.	104—109	..	5 10 1
500,000	100	Dec. 1	6	People's Gas of Chicago, 2nd do.	103—108	..	5 11 1
250,000	10	Sep. 30	10	San Paulo, Ltd.	16—17	..	5 17 3
135,000	Stk.	—	10	Sheffield A.	250—253	..	3 19 0
209,053	,,	—	10	Do. B.	250—253	..	3 19 0
447,427	,,	—	10	Do. C.	250—253	..	3 19 0
5,475,000	Stk.	Aug. 12	5½	South Metrop., 4 p.c Ord	143—146	..	3 11 11
1,416,667	,,	July 15	3	Do. 3 p. c. Db. Stk.	106—109	..	2 15 0
60,000	Stk.	Sep. 15	12	Tottenham and Edmonton, A.	280—290	..	4 2 9
60,000	,,	,,	9	Tottenham and Edmonton, B.	205—215	..	4 3 9
182,380	10	May 27	8	Tuscan, Ltd.	13½—14½	..	5 10 1
149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.	102—105	..	4 15 3
				WATER COMPANIES.			
746,164	Stk.	June 29	10½	Chelsea, Ord.	337—342	..	3 1 5
150,000	,,	,,	5	Do. 5 p. c. Prf.	177—180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p.c. 1 f. Stk., 1875	157—160	..	2 16 3
175,785	,,	Sep. 30	4½	Do. 4½ p. c. Lb. Stk.	160—165	..	2 14 6
1,720,560	Stk.	Oct. 14	7½	East London, Ord.	232—236	..	3 3 8
654,740	,,	June 29	4½	Do. 4½ p. c. Db. Stk.	163—168	..	2 14 3
390,000	,,	,,	3	Do. 3 p. c. Db. Stk	106½—107½	..	2 15 10
700,000	50	Dec. 15	7½	G'd Junct'n, 10 p. c. max.	122—127*	+¾	2 19 0
295,000	£tk.	,,	4	Do. 4 p. c. Db. Stk.	147—152*	+2	2 12 8
708,000	Stk.	Aug. 12	13	Kent	362—367	..	3 10 10
160,000	,,	,,	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	June 29	10†	Lambeth, 10 p. c. max.	307—312	..	3 4 1
406,200	100	,,	7½	Do. 7½ p. c. max.	227—232	..	3 4 8
350,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147—150	..	2 13 4
500,000	100	Aug. 12	13	New River, New Shares	450—455	..	2 17 1
1,000,000	Stk.	July 29	4	Do. 4 p. c. Db. Stk.	153—155	..	2 11 7
902,300	Stk.	Dec. 15	6	Southw'k & V'xhall, Ord.	163—165*	+1	3 12 9
126,500	100	,,	6	Do. do. 7½ p. c. max.	151—154*	+3	3 17 11
489,200	Stk.	,,	5	Do. do. 5 p. c. Prf.	175—180*	+2½	2 15 6
1,019,585	,,	Oct. 14	4	Do. 4 p. c. A Db. Stk.	144—147	..	2 14 7
1,155,066	Stk.	Dec. 15	10	West Middlesex	315—320*	..	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Db. Stk.	162—165*	+1½	2 14 7

* Ex div. † Next dividend will be at this rate.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I had the pleasure, on Tuesday, through the courtesy of the officials of the Glasgow Corporation Gas Department (which I desire here to acknowledge), of attending as your representative the official inspection which the Gas Committee made of the gas-works. It was a magnificent programme. I felt when I returned that a day spent in such a manner was quite an education. The vastness of the works is in itself impressive; but that is only a first idea. The feeling which grows upon the visitor, the more he sees of the works, is the perfection to which appliances have been brought, the order in which everything is kept, and the economy with which the whole work is conducted. Had anyone told me a week ago that some lime-kilns were to be found in Glasgow, I should scarcely have credited the statement. Yet there they were on Tuesday at work; the Corporation doing their own lime-burning, with the advantage of cheapness, and, more than that, of having their lime always fresh and prepared to suit their own requirements. As for the arrangements in the retort-houses at Tradeston and Dawsholm, they are simply a poem in practice. The most striking benefit which is received by such a visit, is in having the great advance which has been made in plant for the production of gas in recent years, brought before one in practical form. From the old Temple works, which in their time were thoroughly up to date, to Dalmarnock is a great advance; but from Dalmarnock to Tradeston and Dawsholm, is a farther cry. I cannot look into the future, so as to be able to say whether it is possible that similar advances may be made; but I could see on Tuesday that Mr. Foulis is still going forward. His settings of twelves are an example. To be able to make half as much more gas than before, upon the same ground, is in itself a great advance—and particularly so when it can be done without additional heat. It is very simple, and very easy to do, after seeing it done; but it is only a master mind which can evolve such things. As to the propriety of holding such official visitations, there should be but one opinion. There is nothing more likely to conduce to the harmonious working of a Corporation, than that the members of it should understand the works they have the responsibility for; and in no better way can this be done than by taking new members round, and showing the works in operation.

In another matter—that of his oil process—Mr. Foulis shows an inventive mind still active. I did not see the plant in operation; but it had been working on Tuesday, and it was explained to us that it is successful. It is regarded as much superior to carburetted water-gas processes—at least for Glasgow, where coal is cheap. I understand the intention is to make oil gas extensively, and thus to do away with the use of cannel. The structural details, I am not familiar with; but I know that the system is different in working from the Peebles process, in that there is no fractional distillation. It is not required to send anything back to the retort, because the whole is vapourized in one vessel, and is then gasified in another. One of Mr. Foulis's objects is to avoid the scorching of the oil; and this he accomplishes by employing a wide retort, against the sides of which the oil never impinges. It is very wonderful; and at present it would seem as if Mr. Foulis had gone ahead of everybody else in the matter of oil-gas manufacture. We have not the working results; but these will doubtless be given by-and-bye, when it will be seen what economy is effected. The success of the process is established; the only matter which requires elucidation is the saving obtained. What with this and the Peebles process—the second one—which is about to be put to a practical test, there should be sufficient material for discussion at next year's meetings of gas managers in Scotland.

As the result of the consideration given by the Gas Committee of the Glasgow Corporation to the subject of the bonuses paid to the Station Managers of the works, Mr. R. M. Mitchell was able to inform the Town Council on Thursday that the practice was to be discontinued. Of course, the Managers will not suffer by the change, which will be better in every way for all parties.

It was reported to the Kilsyth Police Commission this week that the output of gas during the present year, up to the end of November, was 9,972,200 cubic feet; and that the yield had averaged 9882 cubic feet per ton of coal. One member of the Commission wanted to know whether the Manager could not raise the illuminating power by 2 or 3 candles; and he was not to be turned aside in his quest for more light by the explanation that while 25-candle gas was what they were required to give, in reality they supplied gas of 27-candle power. On the suggestion of Provost Wilson, it was left to the Gas Committee to see if anything could be done in the matter.

The Town Council of Stirling, who turned up their noses at a good bargain in the acquisition of the gas-works, are deeply engrossed in a scheme of electric lighting for the town. Their great notion is to employ the water supply to drive the dynamos. It is an original idea. Professor Kennedy has reported against it; but such doughty "municipal statesmen" as they are, who, against all reason, slew the gas transfer, are not to be deterred by the opinion of the expert whose advice they ask and pay for, and so they have sent the subject back to him to give them "a more exhaustive report."

The Hamilton Town Council are promoting a Provisional Order for the introduction of electric lighting. It is not a spontaneous movement on their part. One of the Councillors, at a meeting this week, said that their hands were forced in the matter. What was proposed to be done was to place the electricity plant in the gas-works. The scheme proposed will, it is estimated, cost from £50,000 to £60,000. The Council, however, think that if they could induce the Board of Trade to consent to a restricted compulsory area, they might have the installation laid down for less than £10,000. There is some doubt about the Board of Trade acquiescing in the proposal; but, "at any rate," said one, "it would be at least three or four years before the works could be completed." It was agreed to ask the Board of Trade sanction to a restriction of the area.

There are in Monifieth, as there were in Stirling, some recalcitrants who are doing what they can to overturn a resolution by the Police Commissioners to adopt the Burghs Gas Supply Act. As in Stirling, their method is to appeal to the ignorant—conjuring up disaster to the

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community in the event of the lighting scheme being gone on with. At a meeting of the Police Commission on Tuesday evening, the Clerk submitted a report with regard to the adoption of the Act, in which he stated that he had received a remonstrance against the proposal signed by thirty householders. He stated that, in accordance with the statute, it now remained with the Commission to take a poll on the question. Mr. Archibald White, Convener of the Lighting Committee, said the time had come when it behoved the Commission to put this matter to the test, and endeavour to get Monifieth adequately lit. A great many misrepresentations had been set abroad on this matter; but he was confident that it would not cost the ratepayers anything. He felt sure that it would prove a paying concern. It was agreed that the poll should be delayed till the middle of January next.

The streets of St. Andrews are badly lighted—at least, so say the Police Commissioners, who may be expected to know whether it is so or not, as they have to pay for the service. They would like to improve the lighting; but then, according to what transpired at a meeting of the Commissioners this week, there are the two considerations. The first is that it would cost more money to keep lamps burning all night; and the second, that the men who attend to the lighting and extinguishing of the lamps object to the all-night lighting, on the ground that it would injure their health to attend to it. These men are the scavengers of the town; and there was a general consensus of opinion that the two departments should be separated. The separation may be expected, which is as it should be; and then the men's health will be saved, and the lighting of the town will be better attended to. The improvement in the lighting will depend on the Commissioners' spending more money upon providing the illuminant. There was one phase of the question brought forward which did not receive the attention it deserved; that was the lighting of the lamps on moonlight nights. It is one of those notions which strike the mind of the primitive thinker, that the moon may be relied upon to furnish sufficient light on a certain number of nights in the year; but in practice it is found not to be so. Only one gentleman realized that moonlight was not to be depended upon; but his bringing forward of the proposal to consider whether they might not have the lamps lighted every night during the winter, received no response. All that was done by the Commissioners was simply to talk over the matter, and then to send the subject back to a Committee. The views expressed may help them to come to a finding.

In Broughty Ferry, there are complaints by residents in the neighbourhood of the gas-works regarding smells emanating from the works, and fires occurring therein. A firm of Dundee solicitors are in communication with the Police Commissioners on the subject. One of the Commissioners has given notice of motion to the effect that, at the expiry of the present financial year, the oil-gas plant be laid idle, and that for the ensuing twelve months the manufacture of gas be carried on entirely from coal. He did not give his reasons for this motion; but I suppose he, in some way, associates the one or two fires—or explosions as they were called at the time—to the use of oil. We shall see if that is so next month. But if this should be his reason, and if it should be the fact that the oil plant is responsible, all I have to say is that it must either be the arrangement of the plant or its handling which is at fault, as there are numerous works employing the oil process where no such occurrences have taken place.

Mr. A. Wilson, Engineer and Manager to the Perth Gas Commission, reported this week that the excavations for the new gas-works at Friarton were in hand. There will, after satisfying the requirements of the Gas Commissioners, be about 9000 cubic yards of surplus material. The proposal was made that it should be used for the embankment of a new road which is to be made to Friarton; and the contractors for the excavation offered to deposit the material there for £575. It is found, however, that the whole of the suplus material could not be so utilized; and it has been resolved to use it for the making up of low ground. The contractors have been asked to send in fresh offers for the work. At a recent meeting of the Works Committee of the Gas Commission, the Convener stated that it would be necessary to obtain a loan of £25,000 to meet the cost of the new works. It has, however, been agreed to delay procuring the money until it be seen whether the Police Commissioners will adopt the Local Authorities Loans Act, because in that case the loan, it is anticipated, would be obtained at a cheaper rate. Money is wanted, however; and it was resolved to procure an overdraft from the bank of £5000.

In the First Division of the Court of Session yesterday, their Lordships gave judgment in the application by the Clippens Oil Company, Limited, to have the Edinburgh and District Water Trust ordained to remove the main they recently laid in the public road at Pentland, and to restore the ground to its former condition. The Court recently decided that the pipe had been illegally laid. They have now directed that it be removed, and have found the Water Trust liable in the whole expenses of the action. Lord Adam said that the respondents had spent £5000 upon the new main; but they knew before they incurred the expenditure that they ran the risk of their right to lay the pipe being challenged. They took the risk with their eyes open; and he did not see why the rights of the complainers should be prejudiced because the Trustees chose to incur the expenditure. As to the risk which the Trustees said existed, of the old main which is laid through the Company's mineral field being broken by the working out of the minerals from below it, if there was any such danger, it was one which might easily have been foreseen by the Trustees; and if, with the laudable desire he supposed of saving expense, they preferred laying the pipe, with the result which had followed, he did not see why the rights of the complainers should suffer by the pipe being allowed to remain, when the Trustees could have proceeded in a lawful way to have acquired the minerals under the old line of pipe. The Trustees had given notice of a Bill in Parliament to, among other things, authorize the laying of the new main. But the rights of the Company had been determined by a judgment of the Court; and he did not see why they should not be permitted to enforce the judgment because the Trustees proposed to avoid the effects of the judgment by means of an application to Parliament, which might or might not be successful. This order having now been given, the Trustees, it may be expected, will, instead of implementing it, appeal to the House of Lords, with a view to postponing the undoing of the costly work which they have done until Parliament shall have considered their Bill. The result of this is, of course, problematic; but there need be no hesitation in saying that the

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COLCHESTER	300,000		
BIRKENHEAD	2,250,000		
SWINDON (New Swindon Gas Company)	120,000		

Water Trustees have placed themselves in a very undesirable position by what, to outsiders, appears to be a conflict with the whole oil industry in Scotland, when a little negotiation might have avoided it. Whoever may win in the end, cannot be told; but this at least it is open to say—that it would have been better policy for the Water Trustees to have had their rights decided before they laid the pipe, because it looks as if they wished to circumvent the Oil Company by proceeding as they did, which, to say the least of it, is not dignified.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 18.

Sulphate of Ammonia.—There has been an active market; and good business has been done at advancing prices—the nearest closing values being £8 17s. 6d. per ton f.o.b. Hull, and £9 per ton f.o.b. Leith and Liverpool. The upward movement has been occasioned by the necessity for covering December sales. Buyers were at first reluctant to pay advancing prices; but towards the close, they came forward freely, afraid to leave their purchasing too close to the end of the month, when work is likely to be broken, and transit difficult. Speculative quotations abroad having been withdrawn or advanced, consumers too have advanced their ideas of values, and have bought fairly well. Interest has been mainly centred on prompt delivery; and comparatively little has been done in the forward position, although there has been good inquiry. London is quoted, January-April delivery, at £9 5s. per ton, Beckton terms; and this price has been refused f.o.b. Leith, ordinary terms, delivery over spring months.

Nitrate of Soda remains steady, without anything special to report, at 7s. 6d. per cwt. for good, up to 7s. 7½d. per cwt. for fine, quality.

LONDON, *Dec.* 18.

Tar Products.—Buyers seem more inclined now to consider business in benzols for forward delivery; and no doubt wisely, for, at the present low prices, considerable quantities are being diverted to other uses, which eventually should have an important influence on the price. Pitch, for one reason and another, appears to be slightly weaker, though there are no stocks, and consumers press somewhat anxiously for deliveries. Anthracene is firmer; and there seems every probability of higher rates—most makers being pretty fully sold, and holding any surplus for higher prices. The value of carbolic has been steady, with plenty of inquiry; and producers are asking from 1d. to 2d. per gallon more for the early months of next year. A large business has been done at 2s. for 60's. There has been more inquiry for pressed naphthalene; and buyers offer better prices for this article. Considerable business has been done in creosote, also at improving prices.

Values during the week may be taken as: Tar, 14s. to 19s. Pitch, 16s. to 19s., according to port. Benzols, 90's, 1s. 6d.; 50's, 1s. 8d. Toluol, 2s. 2d. Solvent naphtha, 1s. 7d. Crude, 30 per cent. naphtha, 9d. Creosote, 2¼d.; liquid, 2⅜d. Heavy oils, 45s. Carbolic acid, 60's, 2s. Naphthalene, 55s.; salts, 30s. Anthracene, "A" quality, 5d.; "B," 4d. to 4½d.

Sulphate of Ammonia.—There has been an anxious demand for sulphate; and producers have been able to realize higher prices freely for their make. For prompt delivery, £9, less 3½ per cent., is about the figure. Important business for the early months of next year has been done at higher rates than this.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—In all the better classes of round coal, business still drags on slowly; and pits are not doing more than move away their present output. Quoted prices are unchanged; but the tone in the open market is weak, sellers here and there being prepared to make temporary concessions to effect clearances. With regard to manufacturing classes of fuel, the position shows a slight improvement; the renewed prospects of a settlement of the engineering dispute and the collapse of the threatened stoppage in the cotton trade tending to remove two depressing influences from the market. Though just at present it can scarcely be said that any appreciable effect has been produced upon the actual demand for steam and forge coal or engine fuel, the outlook is decidedly more hopeful. Common round coals are still plentiful in the market, with prices remaining at about 6s. 6d. per ton at the pit, as an average figure for inland sales. The shipping demand continues fairly good; and from 7s. 9d. to 8s. 3d. per ton, according to quality, is being obtained for steam coal delivered at the ports on the Mersey. Supplies of engine classes of fuel are also ample, though the output at some of the collieries, owing to the present restricted demand for round coal, is scarcely sufficient to meet the requirements of their customers. Where supplies are short, there is, however, no difficulty in buying in the open market; and prices remain at about 3s. to 3s. 6d. at the pit for common, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 5s. for best qualities.

Northern Coal Trade.—There has been that increase in the coal trade in the past few days which is usually seen prior to the holidays. Hence fuel of all kinds is in strong demand; and with full work at the collieries guaranteed to the end of the year, prices are steadier, and in some instances a little higher. Best Northumbrian steam coals vary from 8s. to 8s. 3d. per ton f.o.b.; and steam smalls, from 3s. 3d. to 3s. 4½d. Manufacturing coals are very dull. In regard to gas coals, the output of the pits has been so fully taken up that additional cargoes have been rather difficult to obtain; and as high as from 8s. 3d. to 8s. 6d. per ton f.o.b. has been the general quotation for them. There is no alteration in the price of gas coke this week.

Scotch Coal Trade.—There is a somewhat firmer tone in the market, which probably is chiefly due to a slight easing of freight rates, but also to some extent to the fact that many manufacturers are laying in stocks to tide them over the holidays, when work in the pits is frequently very irregular. Prices which are not quotably higher, are: Main, 6s. 9d. per ton f.o.b. Glasgow; ell, 7s. 3d. to 7s. 6d.; and splint, 7s. 6d. The shipments for the week amounted to 151,650 tons—an increase of 2800 tons over the preceding week, and of 26,496 tons on the corresponding week last year. For the year to date, the shipments have been 7,766,883 tons—an increase over the same period of last year of 438,350 tons.

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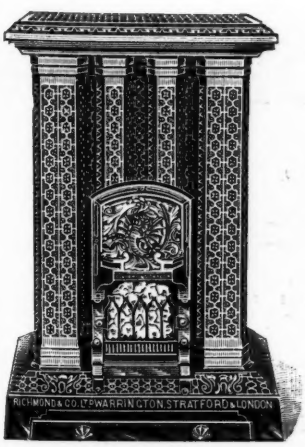

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Reduction in the Price of Gas at Port Elizabeth.—As from the 1st inst., the price charged for gas by the South African Lighting Association in Port Elizabeth has been reduced from 10s. 10d. to 10s. per 1000 cubic feet; the charge for cooking purposes being 8s. 6d. Under the management of Mr. W. Arnott, the service has been considerably extended to all parts of the town. The reduction just made brings the price down to within 10d. of that charged in Cape Town; while it is 3s. cheaper than in Grahamstown, and 11d. less than Johannesburg.

Sales of Gas Stock.—Yesterday week £10,000 of new ordinary stock of the Tynemouth Gas Company was sold by auction. The stock, which is part of that created under the Act of last session, is entitled to a maximum dividend of 5 per cent., and ranks for dividend with the existing consolidated ordinary stock. The prices realized ranged from £126 10s. to £130 5s.—the average being £127 12s. 8d. The total amount produced was £12,763. Messrs. T. Dewhurst and Son recently sold some 10 per cent. "A" stock of the Preston Gas Company at prices ranging from £227 to £229 10s. per cent.; and some 7 per cent. "B" stock at £177 to £180 10s. per cent. A parcel of £140 of consolidated 10 per cent. "A" stock of the Fylde Water Company fetched £477 8s.

Water-Gas Plant for Darlington.—The Darlington Town Council last Friday considered a proposal by the Gas Committee to lay down plant for the production of water gas. It was pointed out by Alderman Barron that the consumption of gas very nearly approached the production; and consequently additional plant was necessary. The carburetted water-gas system had, he said, proved satisfactory in other towns; and there was no danger in its use as was formerly thought. He moved a resolution that water-gas plant of a capacity not exceeding 500,000 cubic feet per day be erected. Mr. Bartlett seconded the motion. Two or three members urged that the adoption of water gas should be delayed until something more definite was known regarding the question of danger; but, in the end, the resolution was carried.

Public Lighting of Plymouth.—The scheme referred to last week, by which the Corporation of Plymouth are to acquire the lamp-columns and brackets from the Gas Company, and take control of the public lighting, received the unanimous approval of the Town Council on the 13th inst. Alderman Phillips, in moving the adoption of the proposal, said the town had not hitherto been lighted so well as they could have wished; and they thought the new arrangement would result in their getting much better lighting without much additional expense. The Corporation would be pretty much in the position of the private consumer, paying only for the gas used. Instead of paying the Company for lamps and the cleaning and lighting of them, the Corporation would buy them, and do the work themselves.

Damage to a Holder at the Bangor Gas-Works.—During a gale of wind on the 16th inst., a 60 ft. by 14 ft. holder at the Bangor Gas-Works was slightly capsized. The holder being full of gas, about 3.45 p.m. a heavy squall of wind drove it to one side with such force as to cause one of the bottom rollers to get on to the side of the tank; and before it could be got off, a quantity of gas escaped, and caused the holder to tilt over with such force as to snap one of the cast-iron guide-rails. When this gave way, the side strain on three of the carriages became so great as to break them. No other damage appears to have been done. The chief cause of the inconvenience resulting from the accident is the want of storage room. As there is only holder capacity for 100,000 cubic feet, with a daily consumption of 220,000 cubic feet, it is necessary that the holders should be full every day.

Suggested Annual Charge on the Douglas Gas Company for the Privilege of Using the Streets.—What may be described as a curious, and little short of humorous, proposal was seriously made, discussed, and adopted at the meeting of the Douglas Town Council last Wednesday. The idea seems to have originated with the Deputy-Mayor (Mr. S. Webb), who moved that, "as Douglas has increased largely during the last twenty-five years, and seeing that the Gas Company derive considerable benefit from such increase without corresponding advantage accruing to the town in payment for the use of the thoroughfares for the Company's mains and pipes, the Council should make application to the Legislature at an early date for authority to impose an annual charge or percentage on the gross receipts of the Company for the privilege of using the streets, and that a Committee be appointed to confer with the Council's legal adviser and prepare a report as to a suitable scheme." Most of the members regarded the motion as a sensible one; and at once elected a Committee to take counsel with the legal adviser, who, it is to be hoped, will not allow his clients to spend time and money in vain.

Fatal Accident at the Saltley Gas-Works.—The Birmingham City Coroner (Mr. I. Bradley) held an inquiry last Friday concerning the death of Abraham Normansell (54), who was killed while following his employment at the Corporation Gas-Works, Saltley. On the previous Wednesday, he and his assistant, a man maned Kelsey, were conveying coal from the storehouse on the second storey to the lift, and thence, by means of the latter, to the first floor. The lift-hole was protected by a block, which was removed to allow the waggons to pass, and which, according to the rules of the works, should have been replaced immediately the trucks were in the cage. Kelsey went down the lift with a loaded truck, and neglected to put the block into position after he had moved it. While he was down the well, deceased came with another waggon; and, evidently expecting to find the lift up, pushed the truck into the hole, and fell with it. Kelsey, who was below, was injured by the falling waggon, and deceased, who fell a distance of 20 feet, was killed instantaneously. Before opening the Court, the Coroner and the jury went to the General Hospital, where Kelsey had been detained owing to his injuries, and obtained a statement from him to the effect that the stop-block was never used. At the inquiry, however, another employee named Hunt, and other witnesses, said the block was used. A verdict of "Accidental death" was returned; but the jury also suggested that the old stop-block should be replaced by an automatic one; and they also expressed the opinion that there had been negligence in the use of the present apparatus. Mr. S. Knyvett, Inspector of Factories, said that the present block was effective, but he agreed that automatic means should be adopted. Mr. Henry Hack, the Superintendent of the station, said the Gas Committee deeply regretted the occurrence, and would do all they could for the widow, and do their utmost to prevent a recurrence of the calamity.

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Completion of the Eccup Reservoir.—The protracted operations at the Eccup reservoir of the Leeds Corporation, for the purpose of stopping an unfortunate leak, to which reference has been made in our columns, are now almost completed. The Water-Works Committee paid a final visit to the works last Friday, and, on their behalf, Alderman Cooke, the Chairman, expressed to the City Engineer (Mr. T. Hewson, M.Inst.C.E.), and to Mr. Isaac Gould, the Contractor, their satisfaction at the manner in which the extensive and difficult operations had been carried out during the eight years they had been in hand. It was unanimously resolved to commemorate the completion of the works by a tablet.

New Gas-Works for Carlisle.—At the meeting of the Carlisle Town Council last Tuesday, the Gas Committee introduced an important project for laying down additional gas plant at Boustead's Grassing, at a cost of £28,000. It was suggested by members of the Council that the time was inopportune, not only because the Corporation have so many large projects in hand, but because the introduction of the electric light and the possible substitution of that illuminant for gas at the Citadel Station might greatly reduce the consumption of gas. To this the Chairman of the Gas Committee replied that the experience elsewhere had been that the introduction of the electric light led to no diminution in the consumption of gas; but, on the contrary, the quantity consumed generally increased. Moreover, the extension of the works he held to be imperative, inasmuch as they were now taxed to within 80,000 cubic feet per day of their full capacity. He promised, however, that more detailed plans and more precise estimates should be submitted to the Council within the next month; and the subject therefore stands over.

Bilston Gas Company.—In the report to be presented at the annual meeting of this Company on the 3rd prox., the Directors state that the profit and loss account, after paying the usual interim dividend, shows a balance of £3925. Out of this it is proposed to pay dividends of 5s. and 3s. 6d. per share on the "A" and "B" shares respectively; making with the interim dividend, 10s. and 7s. for the year, and leaving a balance of £1510. The Directors are pleased to report that the use of prepayment meters is extending among the small consumers; but in order to promote their use still further, they are now supplying fittings free—the hire of meters and fittings being included in the charge for gas. Already there are upwards of 600 of these meters in use. The general increase in the sales of gas for the year has been 6½ per cent. For some time past the Directors have been hoping to reduce the price of gas; and they intend to do so from the end of the Lady-day quarter next. To those now paying 3s. per 1000 cubic feet the price will be reduced to 2s. 10d.; and to those paying 2s. 7½d., 2s. 6d.—the discount of 5 per cent. to be allowed as hitherto.

Serious Accident at the Bradford Corporation Water-Works.—Last Saturday week, a serious accident befel the Bradford Corporation at Greenhow Hill, in connection with the conduit forming part of the new Nidd Valley water scheme; and at the meeting of the Council on Tuesday, Alderman Houldsworth, the Chairman of the Water Committee, made a statement in reference to it. He said that the main shaft, at the bottom of which tunnelling had been done for 250 yards in opposite directions, in order to meet other sections of the tunnel already completed, was flooded by an incursion of water, which took place near the bottom of the shaft. Pumping was being carried on at the rate of 660,000 gallons a day, and this was increased to 760,000 gallons; but as the water began to come in at the rate of a million gallons daily, it was impossible to cope with it. At the time of the incursion, the Chief Engineer and one of his assistants were at the bottom of the shaft; and with the help of their experience and judgment, the men, and practically the whole of the tools, were got out. The following day, however, the shaft, which was 450 feet deep, was filled for 300 feet with water, and all the pumps were drowned. This was a serious thing for the contractors; and it also meant considerable delay in the progress of the works. The only conclusion to which one could come from the accident was that there must have been some extensive loosening in the formation of the strata, which the tunnel in its course had tapped, and that the water from the extreme rainfall had forced its way through.

Prospective Absorption of the Commissioners of Sewers of the City of London.—At the meeting of the Court of Common Council of the City of London last Thursday, Alderman Sir G. F. Phillips brought up a report of the Special Committee submitting a scheme for carrying out the City of London Sewers Act, 1897. It was based on the principle underlying the Act, that the Court of Common Council itself should take the position of the present Commission of Sewers. The Committee desired it should be very clearly understood that it was not for a moment suggested that any question had arisen as regarded the manner in which, up to the present time, the Commissioners had fulfilled their trust—indeed, it was with the utmost satisfaction that they recognized the very useful and valuable work of the Commission, evidences of which were to be seen and experienced at all points of the City, alike in respect to street improvements, sanitary works, and the daily cleansing and lighting of the streets. On and after the 10th prox. they proposed that the Act should be carried out by a department of the Corporation, called the Public Health Department. Four Committees would be appointed—viz., Improvements and Finance Committee, Streets Committee, Sanitary Committee, and Accounts Committee. The Court of Common Council would meet weekly instead of fortnightly; priority being given to the business of the Public Health Department at alternate sittings. The official staff of the Commission would be transferred in a body to the Corporation, at their present salaries and under the present conditions of their respective appointments. As regarded the legal work of the Commission, the Committee suggested that all contentious business and prosecutions should be transferred to the City Solicitor, and the conveyancing work to the City Comptroller.

Bulawayo Water-Works Company, Limited.—The third ordinary general meeting of this Company was held last Tuesday at Cannon Street Hotel. Mr. A. Weston Jarvis presided, and, in moving the adoption of the report, stated that no accounts could be presented until the works were handed over by the Contractors—Willoughby's Consolidated Company, Limited. The capital of the Company was £200,000, and Willoughby's Company undertook the contract for the works, for which they had received shares. The works would have been completed but for the difficulties of the past eighteen months. The Government, therefore, gave them an extension of time until the 31st inst., and they had obtained a further extension, should it be necessary, until March 31 next. They had proved the water-works scheme as being able to store a quantity of water. The capacity of the dams was 41 million gallons; and before the rainy season was over in Rhodesia, their three dams were full. He regretted to say that the dams were not absolutely satisfactory in their construction; and the Contractors had had to incur considerable expense in improving them. They expected to be able to start as a going concern in the next month or two. The authorized charge allowed by the Government was 1s. 3d. per 100 gallons, which ought to be very remunerative. With respect to the electric light, which was also part of their scheme, the installation ran successfully throughout the week of the festivities in connection with the opening of the railway at Bulawayo; and it would run continuously as soon as the reservoirs were connected with the dams, and they could get a continual supply of water for the boilers. The authorized charge allowed by the Government for the electric light was 2d. per hour per light of 16-candle power. He hoped next year they would be able to show actual results through the working of the concern; and they had confidence that the undertaking would be a successful one. Sir John C. Willoughby seconded the motion; and it was carried.

The whole issue of £6000 of additional 5 per cent. stock in the Draycott Gas Company has been fully subscribed for at prices varying from £110 to £112 per cent.

The Directors of the Newcastle and Gateshead Water Company are about to offer for sale by tender £30,000 of 4 per cent. perpetual debenture stock at a minimum price of £140 per cent.

Tenders were recently invited for £2500 of stock of the Falmouth Water Company, and applications for £5550 were received; £3900 being at premium—in some cases of more than 10 per cent. The Directors have decided to issue £5000 of 5 per cent. preference stock.

Tenders for the £100,000 of East London Water Company's 3 per cent. debenture stock were opened on Monday last week. The minimum price was par. The highest accepted tender was at £7 5s., the lowest at £3 16s. 6d. per cent. premium; the average being £4 8s. 4½d.

Mr. J. H. Sheldrake, at present the General Manager of the Sunlight Company, has been engaged by the Welsbach Company in their Works Department. In consequence, the Sunlight Company are now advertising for someone qualified to act as Mr. Sheldrake's successor. We understand the Directors are fully alive to the wisdom of securing a high-class man, and are prepared to be liberal in their terms.

Messrs. Richmond and Co., Limited, are distributing particulars of a "motto competition" they have just brought out. Suitable mottoes are invited for six of the Company's stoves, of which illustrations are given; and prizes to the value of upwards of £30 will be awarded. These will consist of stoves ranging in value from £6 10s. down to £1 1s.; the lowest prizes being copies of the "Richmond Cookery Book" (price 2s. each), noticed in the "JOURNAL" last week. Mr. G. E. Richmond, B.A. Lond., B.Sc. Lond., is to be the Judge. The competition will close on Feb. 1, 1898; and the results will be notified in the "JOURNAL" for March 1.

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[For Illustrated Advertisement, see Dec. 7, p. 1218.]

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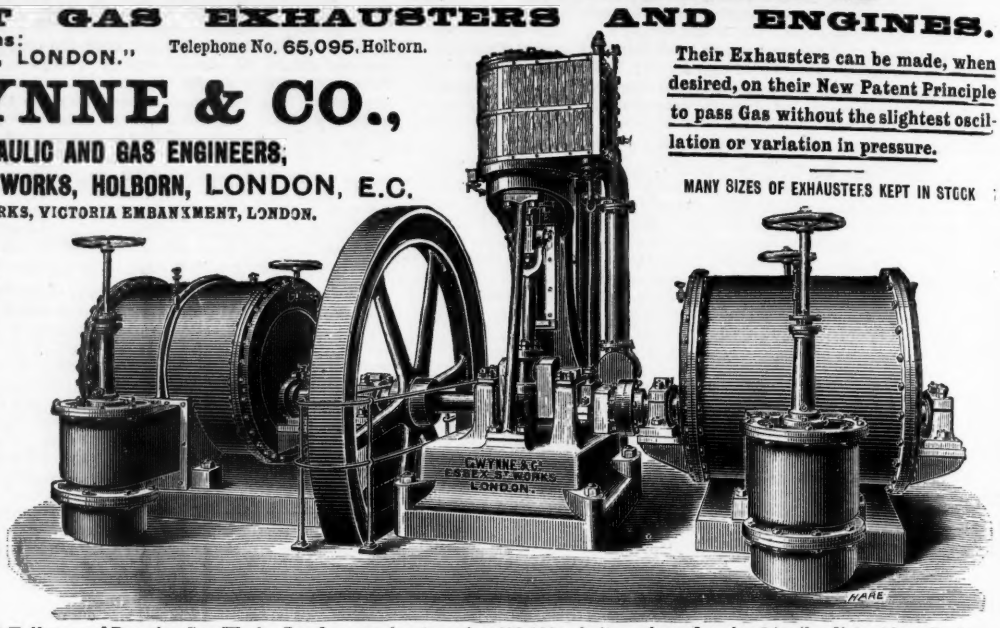

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DISUSED Plant for Sale—viz., 500,000 Cubic Feet WALKER'S PATENT PURIFYING MACHINE; Eight PURIFIERS, 12 ft. Square; 250,000 Cubic Feet KIRKHAM, HULETT, and CHANDLER'S WASHER-SCRUBBER; MANN and WALKER'S TOWER SCRUBBER, 5 ft. by 38 ft.
Apply to the GAS-WORKS, HARROGATE.

THE Oxford Gaslight and Coke Company will have FOR DISPOSAL in 1898 a Set of Four PURIFIERS, 26 ft. by 22 ft. by 5 ft. deep, with Cockey's Centre-Valve and 18-inch Connections and Lifting Apparatus complete. Also a Set of Four PURIFIERS, 20 ft. by 20 ft. by 5 ft. deep, with Six Cockey's Four-Way Valves and 15-inch Connections and Lifting Apparatus complete. One Set will be ready for removal in April, and the other in August next. The IRON ROOFS, with Columns for both Sets, can be purchased if required. They also offer Twelve unusually strong ROOF PRINCIPALS, 50 feet span.
The whole can be seen at the Gas-Works, Oxford.
By order of the Board,
JAMES ELDRIDGE,
Engineer.

FOR DISPOSAL, BY TENDER,
THE Professional Library of the late Mr. F. T. C. Linton, of Leith, consisting of about 160 Volumes, all in condition equal to new.
The Books comprise Volumes of the "Journal," "Engineer," "Engineering," Transactions of various Societies, and Miscellaneous Works on Gas and other Engineering Subjects. A full list can be inspected at the Office of the "JOURNAL."
Tenders for the Books will be received up to Jan. 15, addressed to No. 2977, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HAWORTH URBAN DISTRICT COUNCIL.
TENDERS are invited for the purchase of the Council's surplus TAR and LIQUOR for the Year ending Dec. 31, 1898, delivered on Rails at Haworth Station.
Tenders to be sent to me not later than Dec. 29.
WILLIAM ROBERTSHAW,
Clerk to the Council.
Burlington Chambers, Keighley.

THE Directors of the Worksop Gas Company invite TENDERS for the purchase of the surplus TAR and the AMMONIACAL LIQUOR made at their Works from the 1st of January to the 31st of December, 1898.
Tenders for Tar to state price per ton, delivered into Purchaser's Tanks, at the Worksop Railway Station.
Tenders for Liquor to state price per ton, as tested by Twaddel's No. 1 Hydrometer, delivered into Boats near the Company's Works, or price per ton, delivered into Purchaser's Tanks, at the Railway Station.
The Directors do not bind themselves to accept the highest, or any tender.
Tenders to be sent in by the 30th of December.
Worksop, Dec. 11, 1897.

Now Ready, Price 10s. 6d.
WARNER'S DIAGRAMS
OF THE ANNUAL
AVERAGES OF PARLIAMENTARY RETURNS RELATING TO GAS UNDERTAKINGS,
1887 TO 1895.
Together with the Private and Public Undertakings Grouped—1895 and 1896 Workings.
COMPILED BY
W. J. WARNER, of South Shields.

These Diagrams, which were noticed in the "JOURNAL" for Aug. 24, 1897, may be had of
WALTER KING, 11, Bolt Court, FLEET ST., E.C.

NEWCASTLE AND GATESHEAD WATER COMPANY.
SALE BY TENDER OF £30,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.
MINIMUM PRICE: £140 PER CENT.
NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £30,000 of the NEWCASTLE AND GATESHEAD WATER-WORKS DEBENTURE STOCK, bearing Interest at the rate of Four per Cent. per Annum, to be issued under, and subject to, the Provisions of the Newcastle and Gateshead Water-Works Act, 1893, and the various Acts incorporated therewith, and in pursuance of a Resolution passed at a Special Meeting of Proprietors held on the 29th day of February, 1892.
Particulars and Forms of Tender may be obtained on application to the undersigned; and tenders must be sent in so as to be received at the Offices of the Company not later than Two o'clock on Monday, the 10th of January, 1898.
By order,
GEO. SMITH,
Secretary.
Pilgrim Street,
Newcastle-upon-Tyne, Dec. 14, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.
MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.
He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.
Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.
Offices: 18, FINSBURY CIRCUS, E.C.

GAS PURIFICATION BY
HYDRATED OXIDE.
THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimize Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.
SPENT OXIDES containing Blue, also CRUDE FERRO-CYANIDE PRODUCTS, either PURCHASED or EXCHANGED for FRESH OXIDE.
MANCHESTER OXIDE COMPANY, LTD.,
CANAL ST., MILES PLATTING, MANCHESTER.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

THE
"ETNA" FIRE & HEAT RESISTING
CEMENT,
For RETORT PURPOSES, is INVALUABLE.
Sole Manufacturers:
FRED VERITY & SON,
CALL LANE, LEEDS.
Scores of Testimonials received. Write for Particulars.

Telephone: Castleford No. 214. | Postal Address: Castleford.
Telegrams: "Silkstone Castleford."
THE SILKSTONE & HAIGH MOOR COLLIERIES, LTD.
ALLERTON BYWATER, CASTLEFORD.
Steam, Manufacturing, & Gas Coals & Cannel.
Analysis, Contracts, Trial Waggons, and Quotations for Large and Small Orders. Inquiries Solicited.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per ton . . 10,500	Cubic Feet.
Illuminating Power . . 16·9	Candles.
Coke . . . . . 66·7	Coke.
Sulphur . . . . . 0·86	Sulphur.
Ash . . . . . 2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.
Telegraphic Address: "PARKINSON NEWCASTLE."

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.
FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,

CHESTERFIELD.

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton	11,205 Cubic Feet.
Illuminating Power	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England, and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

EVESON FOR CANNEL

TELEGRAMS:

"EVESON, BIRMINGHAM."

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

BOGHEAD CANNEL

OR

TORBANEHILL MINERAL.

JAMES WOOD, LTD.,

Are the only Producers of the famous original

BOGHEAD CANNEL or TORBANEHILL MINERAL.

F.o.b. or c.i.f. Prices on Application to

28, ROYAL EXCHANGE SQUARE,

GLASGOW.

THOMAS TURTON

AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

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GAS—NO MORE MANTLES.

BILLING'S NON-MANTLE INCANDESCENT GAS-BURNER. Perfect Light and Cheapness combined. 5s. 6d. Complete; Postage, 6d. extra. Lasts a Lifetime. Can be fixed to any existing Gas-Fittings. Gas-Fitters invited to see it; and Agents required.

Offices, where Samples can be seen (ROOM K),

17, GREAT TITCHFIELD STREET, W.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL CO., LD.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895*,

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·78 „

For Price, &c., apply to the

WEARDALE IRON & COAL CO., LD.

QUAYSIDE, NEWCASTLE-ON-TYNE.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

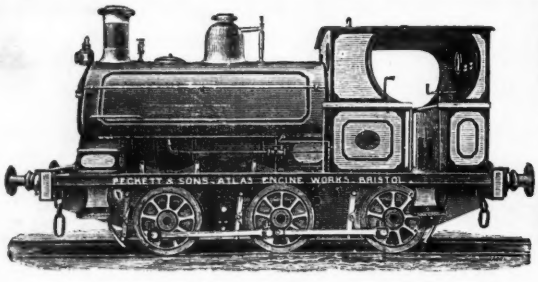
THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.



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LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for Immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

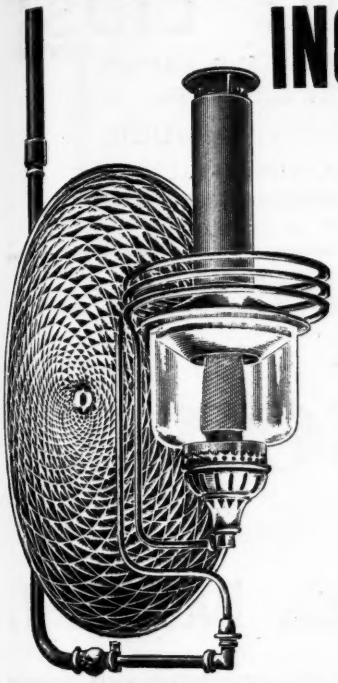
G. & J. HAIGH,

Raven's Lodge Fire-Brick Works, DEWSBURY.

FIRE-BRICKS of the highest Quality, made from Fire-Clay of a most Superior and Refractory Character, suitable for **GLASS-WORKS, GAS-WORKS, and BLAST-FURNACES.**

WHITE GLAZED AND SALT GLAZED BRICKS, BUFF FACING BRICKS, &c.

For Prices and Analysis, apply as above.



INCANDESCENT GAS LIGHTING

May now be adopted **IN MILLS** and all kinds of **WORKS**; and, however severe the VIBRATION may be,

CLAY'S PATENT SHOCK-PROOF FITTINGS

are the next best things to UNBREAKABLE MANTLES.

The Illustration shows one arrangement for Mills or Works. Made of ONE PIECE OF PURE COPPER TUBE, it is THE VERY ACME OF SIMPLICITY AND DURABILITY!

WRITE FOR OUR ILLUSTRATED CATALOGUE WITH FURTHER INFORMATION.

WARNING: As we hold the Master Patents covering the Coiling of Supply Pipes to obtain a resilient bearing to neutralize the damaging effect of Shock or Vibration on the Mantles of Incandescent Burners, we shall not hesitate to immediately INSTITUTE PROCEEDINGS against anyone INFRINGING OUR RIGHTS.

CLAY & WALMSLEY,

(Late W. R. CLAY & CO.)

BOLTON, LANCASHIRE, ENG.

Telegrams: "CLAYS, BOLTON." See Illustrated Advt. in "JOURNAL" Nov. 30, p. 1155.

LONDON REPRESENTATIVES: Messrs. HENRY GREENE & SONS, 153 and 155, Cannon Street, E.C.

COLUMNLESS HOLDERS.

Notwithstanding the antagonistic influence of firms who are not permitted to construct Holders on **GADD & MASON'S PATENT SPIRAL GUIDE SYSTEM**, their adoption grows larger every year. Intelligent Gas Engineers appreciate the **GREATER SAFETY** of these Holders, and the very great **SAVING IN COST** of from **20** to **30 PER CENT.** No first-class Engineer should now think of paying for so much Metal in the shape of Columns, and the Labour of Erection.

A few months ago the "JOURNAL OF GAS LIGHTING" referred to

"THE KNELL OF GASHOLDER GUIDE-FRAMING,"

which speaks volumes.

In order to meet the ever-increasing demand, we have granted **Licenses for the construction of our patent System of Holders to a select few of the leading Gasholder Makers,** from whom Estimates and Particulars can be obtained.

Gas Engineers are enjoined to avoid Firms who talk twaddle about Columns giving greater strength, merely in order to obtain an Extra Price for the weight of Metal therein and the Labour in Erection. Prices of Materials and Labour are constantly advancing—a sufficient reason why all Engineers should place their orders with Firms who can give them our Holders, and so save considerably in first cost, as well as Repairs, besides getting a **STRONGER, SAFER,** and a **BETTER SYSTEM.**

The first Gadd and Mason Holder was erected some Eight Years ago at Northwich. It has withstood the most violent Storms (one of which brought down the chimney stack); and we believe up to now has not cost a single fraction for Repairs.

American Licensees:
THE GAS ENGINEERING CO., PITTSBURG.

German Licensee:
HERR AUG. KLÖNNE, DORTMUND.

THE PATENT GASHOLDER SYNDICATE, 504, Stockport Rd., MANCHESTER.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Dec. 7, p. 1259.]

TELEGRAPHIC ADDRESS: "GAS, LEEDS."
CLAYTON, SON, & Co.
LIMITED,
LEEDS,
MAKE
RETORT LIDS
OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC MACHINERY.
LONDON OFFICE: 80, QUEEN VICTORIA STREET, E.C.
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WOMBWELL MAIN COMPANY, Ld.,
BARNSLEY.
BEST GAS COAL.
ANALYSIS: 11,390 feet of 17-Candle Gas. Value in Sperm per ton, 686 lbs.
By R. O. PATERSON, C.E.
APPLY
WOMBWELL MAIN COMPANY, LIMITED, BARNSLEY.
Telegrams: "MAIN, WOMBWELL."

D. HULETT & CO., Ltd.
55 & 56, High Holborn, London.
GAS SERVICE CLEANSERS.
LAMP TORCHES.
DRY GAS-METER MAKERS.
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PRICE LISTS ON APPLICATION.

MOBBERLEY & PERRY
STOURBRIDGE.
Manufacture & supply best quality of
Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)
Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.
FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c., &c.
EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.
London Agents: Contractors for the erection of Retort-Benches complete.
BALE & HARDY,
Gas Engineers and Contractors,
BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

W. C. HOLMES & CO.

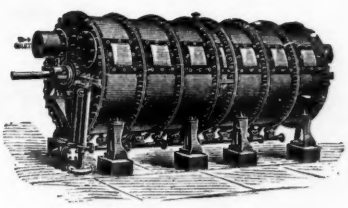
IRONFOUNDERS AND CONTRACTORS.

Makers of
GAS & CHEMICAL
PLANT.

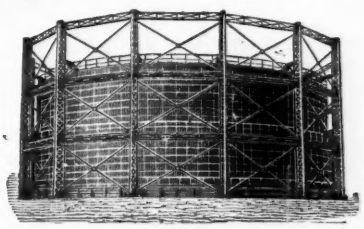
Telegrams:
"HOLMES, HUDDERSFIELD."

Improved
PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

MALLEABLE
and all Kinds of
CASTINGS.



GASHOLDERS of Improved Construction and of all Sizes.
ROOFS, BRIDGES, TANKS, GIRDERS.



Improved
BYE-PASS and
CENTRE-VALVES,
GOVERNORS,
and METERS.

Rotary or Pump
EXHAUSTERS.

80, CANNON STREET, LONDON,
AND
WHITESTONE IRON WORKS, HUDDERSFIELD.

OIL FOR GAS MAKING

PURE DISTILLATE.

HOMOGENEOUS IN CHARACTER.

NO MIXTURE.

CAN BE STORED SAFELY ANYWHERE.

FLASH POINT GUARANTEED OVER 200° FAHR.

(ABEL'S CLOSED TEST.)

ANGLO-CAUCASIAN OIL COMPANY, LTD.

18 & 19, GT. ST. HELEN'S, LONDON.

INDIA BUILDINGS, CROSS ST., MANCHESTER.

TELEGRAMS: "FIRECLAY," LEEDS.

TELEPHONE No. 612.

COAL and COKE
Breakers, Elevators,
AND
Conveyors.

RETORTS,
Bricks, Blocks, Tiles,
&c.

ENGINEERS IRONFOUNDERS
CONTRACTORS MANUFACTURERS

EVERY
DESCRIPTION OF

RETORT SETTINGS
AND
IRONWORK.

WE GUARANTEE
RESULTS.

BUILDINGS,
ROOFS.

RE-SETTING
RETORTS.

We desire to call attention to our SHALLOW REGENERATIVE SETTINGS, which are comparatively inexpensive to erect, and productive of excellent results. They are specially designed to suit those Retort Houses where for various reasons it is undesirable to excavate to any great depth.

We shall be pleased to furnish Designs and Estimates on application.

THE LEEDS FIRECLAY CO. LTD., ENGINEERING DEPARTMENT, WORTLEY, nr. LEEDS.

THE "TRAFALGAR"

PREPAYMENT GAS-METER

FOR PENCE, SHILLINGS, OR ANY COINAGE.

THE ADVANTAGES OF THIS SYSTEM ARE:

1. Simplicity of Mechanism.
2. Absolute Accuracy.
3. Impossibility of being tampered with.
4. Unaffected by irregularities in shape or thickness of the penny.
5. Can be fixed to any ordinary Wet or Dry Meter.
6. Extra large Money-Box.
7. Price Changer can be altered without otherwise disturbing the Meter.
8. Index showing number of Pennies in the mechanism at any time.
9. Rejection of Half-Pennies certain.

GUARANTEED FOR FIVE YEARS.

FRANK WRIGHT'S PREPAYMENT GAS-METER CORPORATION, Limited,

Telegraphic Address: "Gasometer, London."

Manufacturers of Wet and Dry Gas-Meters.
Offices and Works: 62, GLENGALL ROAD, S.E.

Telephone No. 59 Peckham.

PENNY-IN-THE-SLOT GAS-METERS,
SHILLING-IN-THE-SLOT METERS.
Every Description of ORDINARY GAS-METERS.

THE AUTOMATIC
GAS-METER (1895) CORPORATION, LTD.

ROCK METER WORKS,
TORTWORTH STREET, STRANGEWAYS, MANCHESTER.
London Address: 59, QUEEN VICTORIA STREET, E.C.

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "Evans Wolverhampton." PLEASE APPLY FOR CATALOGUE No. 8. National Telephone No. 7089.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

NO TAPPETS.

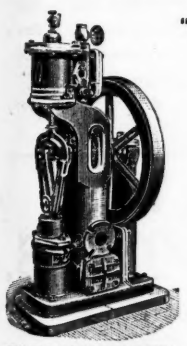


Fig. 705. "SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

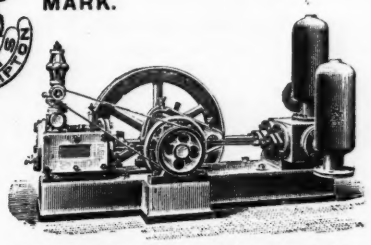


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

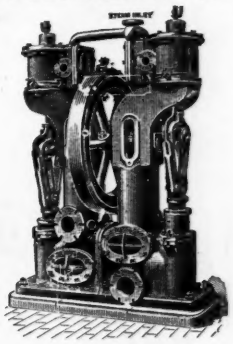


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

LONDON OFFICE
60, QUEEN VICTORIA ST. E.C.

TELEGRAPHIC ADDRESSES
"DRAKESON HALIFAX."
"ECLAIRAGE LONDON."

TELEPHONE No. 43.
"HALIFAX EXCHANGE"

GAS ENGINEERS.
CONTRACTORS.
IRONFOUNDERS.

JONAS DRAKE & SON

SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
— FOR —
ENGLAND, WALES & ABROAD.
RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.

OVENDEN HALIFAX

RETORT SETTERS.
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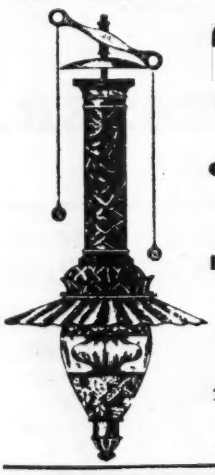

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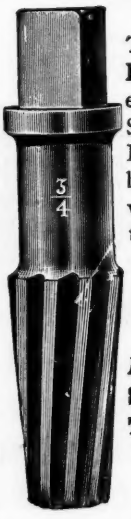

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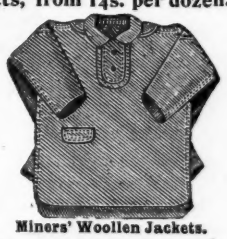

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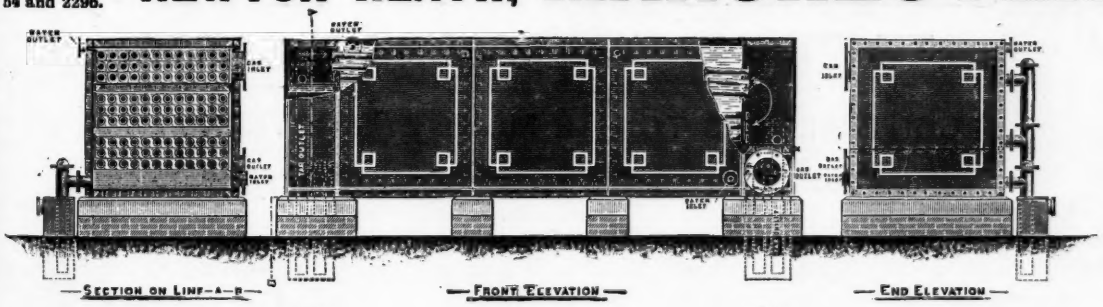

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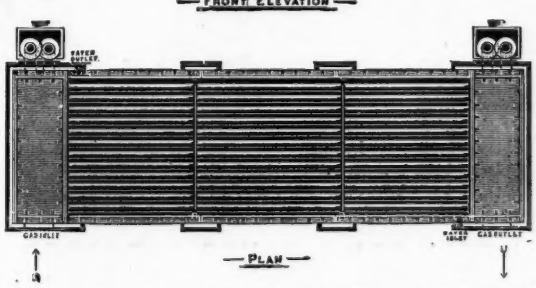

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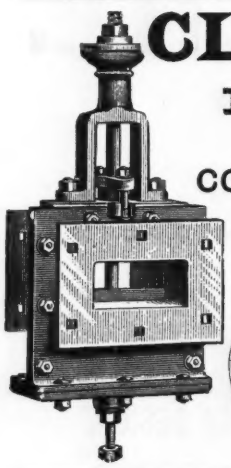

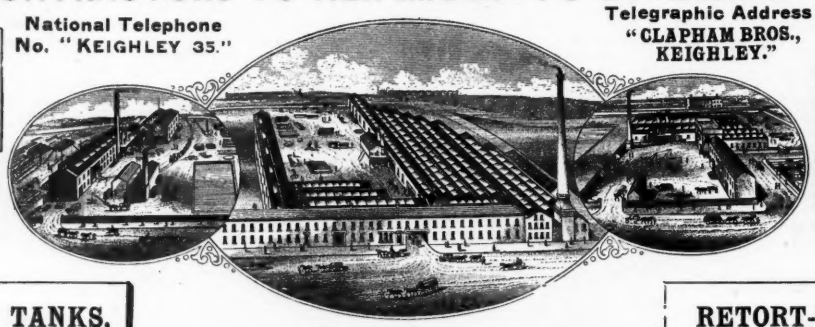

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